

# **EXHIBIT A**



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**United States Patent [19]**

Lewis et al.

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[45] Date of Patent:	<b>Jul. 4, 2000</b>

[54] AUTOMATED BANKING MACHINE ENCLOSURE

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[21] Appl. No.: **09/089,287**

[22] Filed: **Jun. 2, 1998**

**Related U.S. Application Data**

[60] Provisional application No. 60/066,971, Nov. 28, 1997.

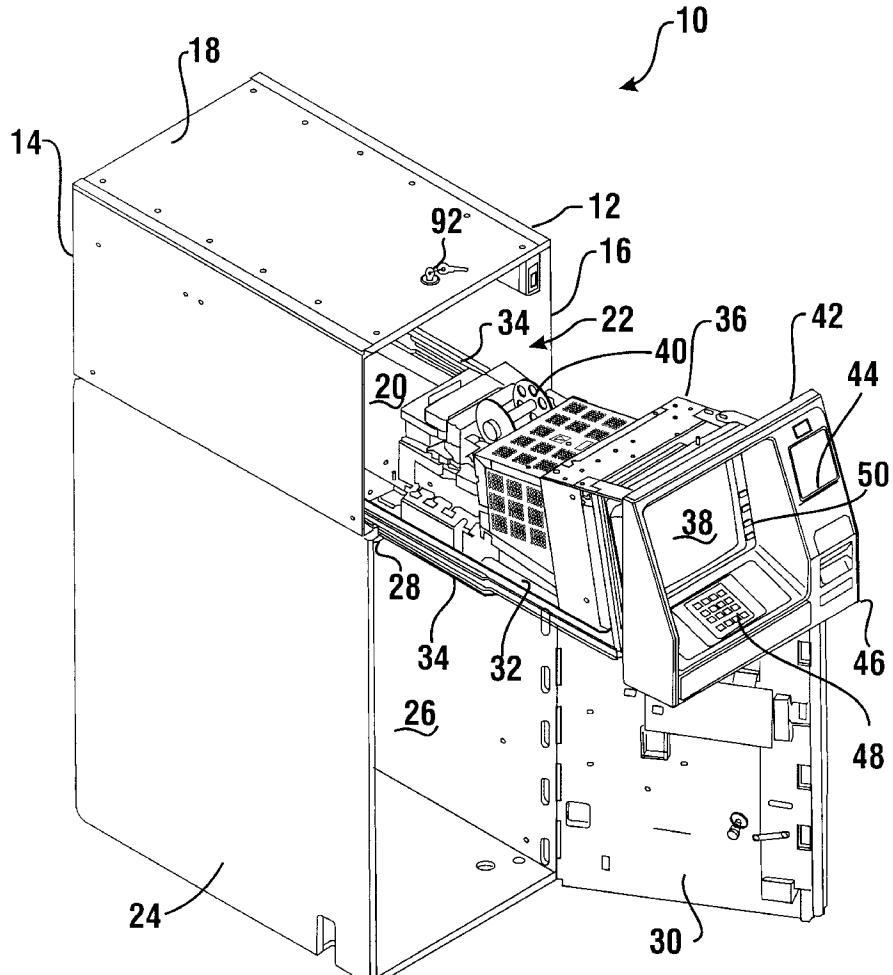
[51] Int. Cl.<sup>7</sup> ..... **G06K 17/60**

[52] U.S. Cl. ..... **235/379**; 902/30

[58] Field of Search ..... 235/379, 486; 902/30, 31

**ABSTRACT**

An automated banking machine (10) has a housing (12). A rollout tray (32) supports serviceable components including a display (36) and a keypad (48) thereon. The rollout tray includes a service opening (54) which is used to access service points on the serviceable components when the rollout tray is extended from the housing. When the tray is retracted access through the service opening is blocked.

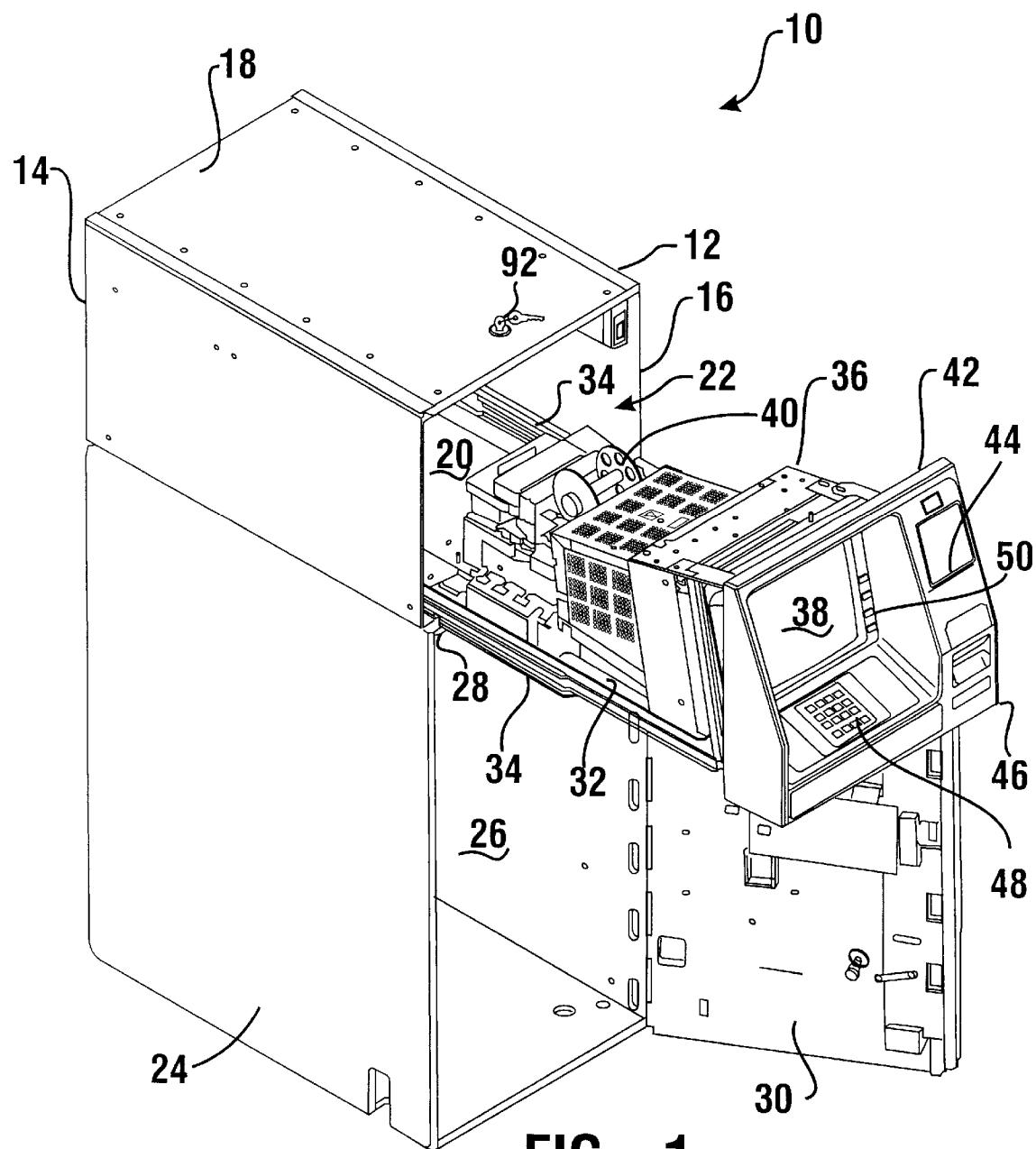
**31 Claims, 10 Drawing Sheets**

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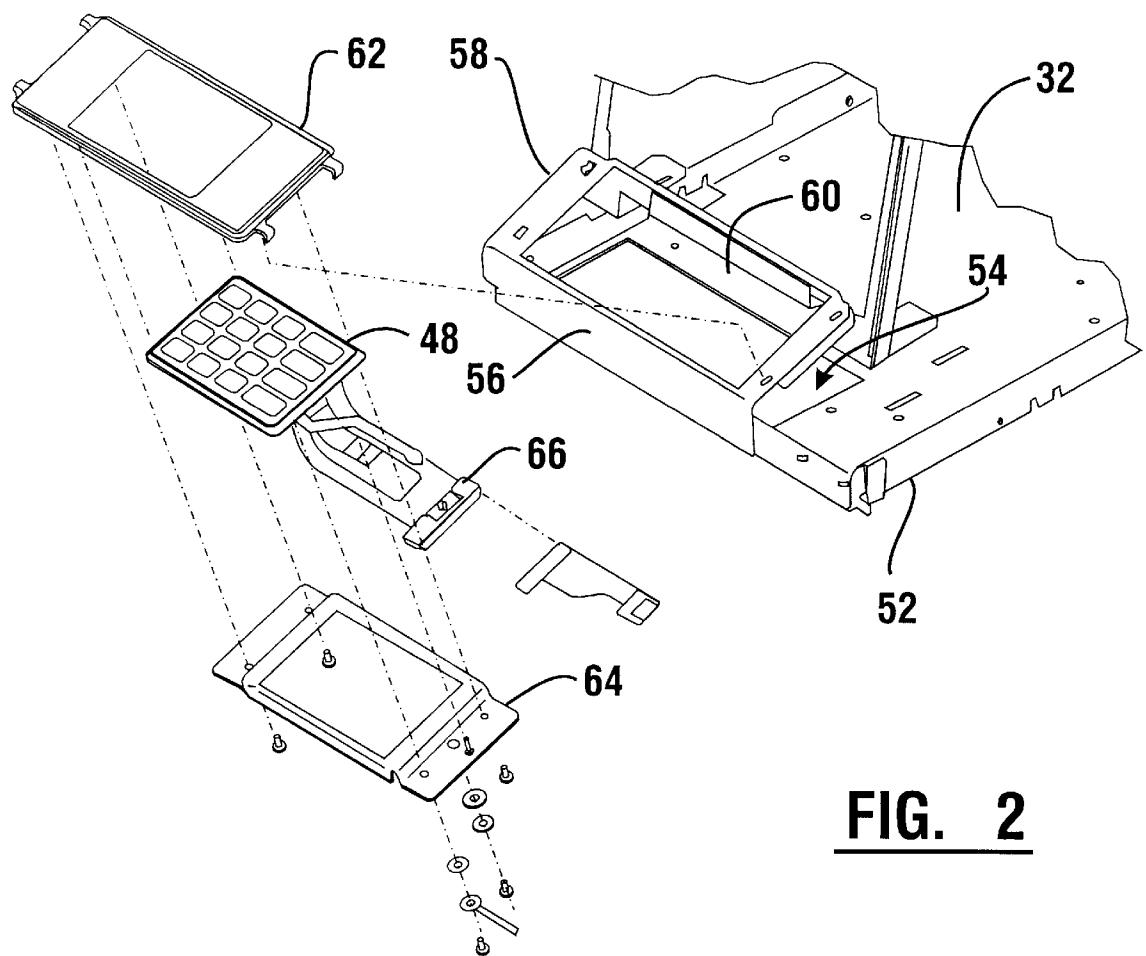
**FIG. 1**

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**FIG. 2**

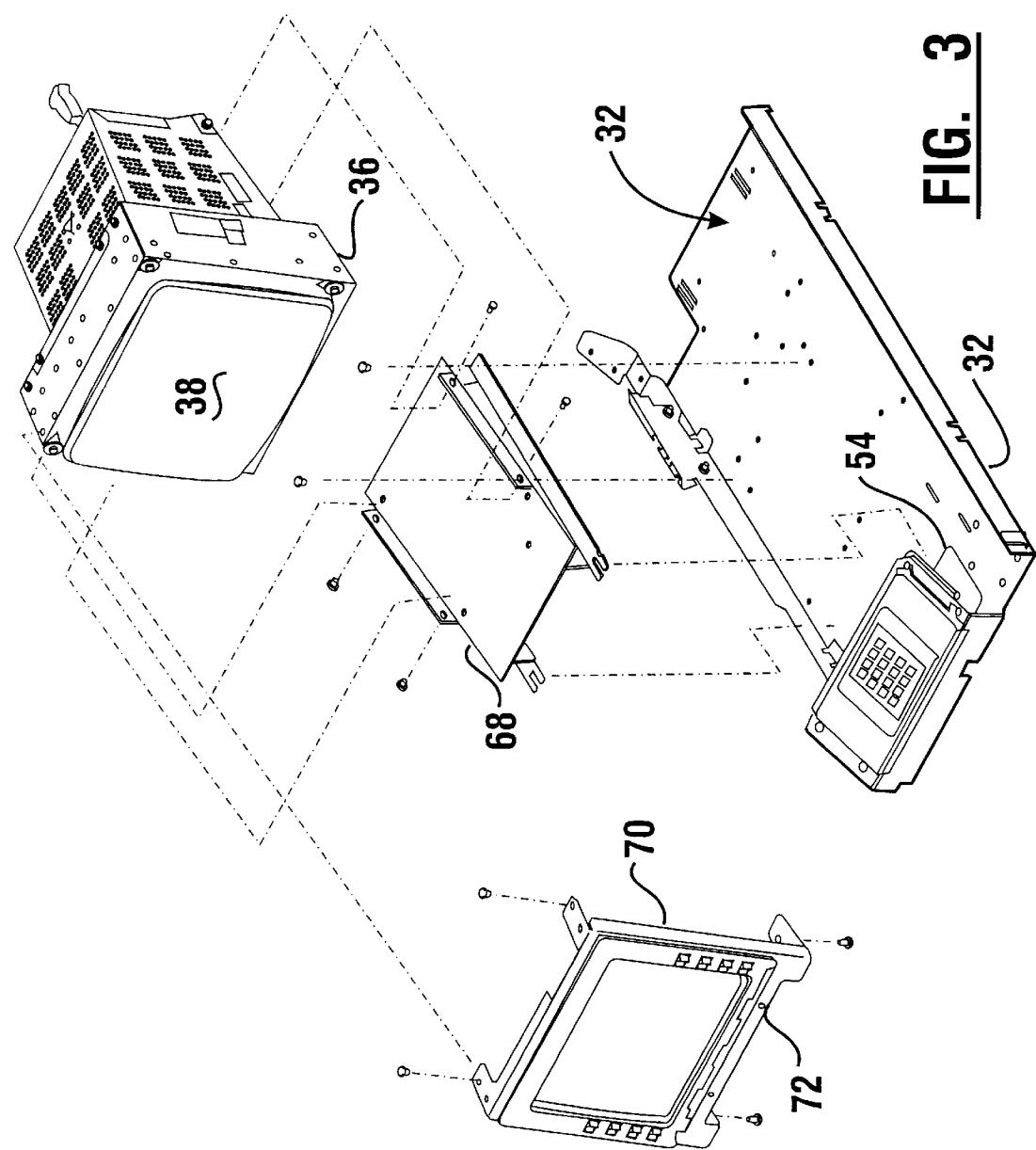
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**FIG. 3**

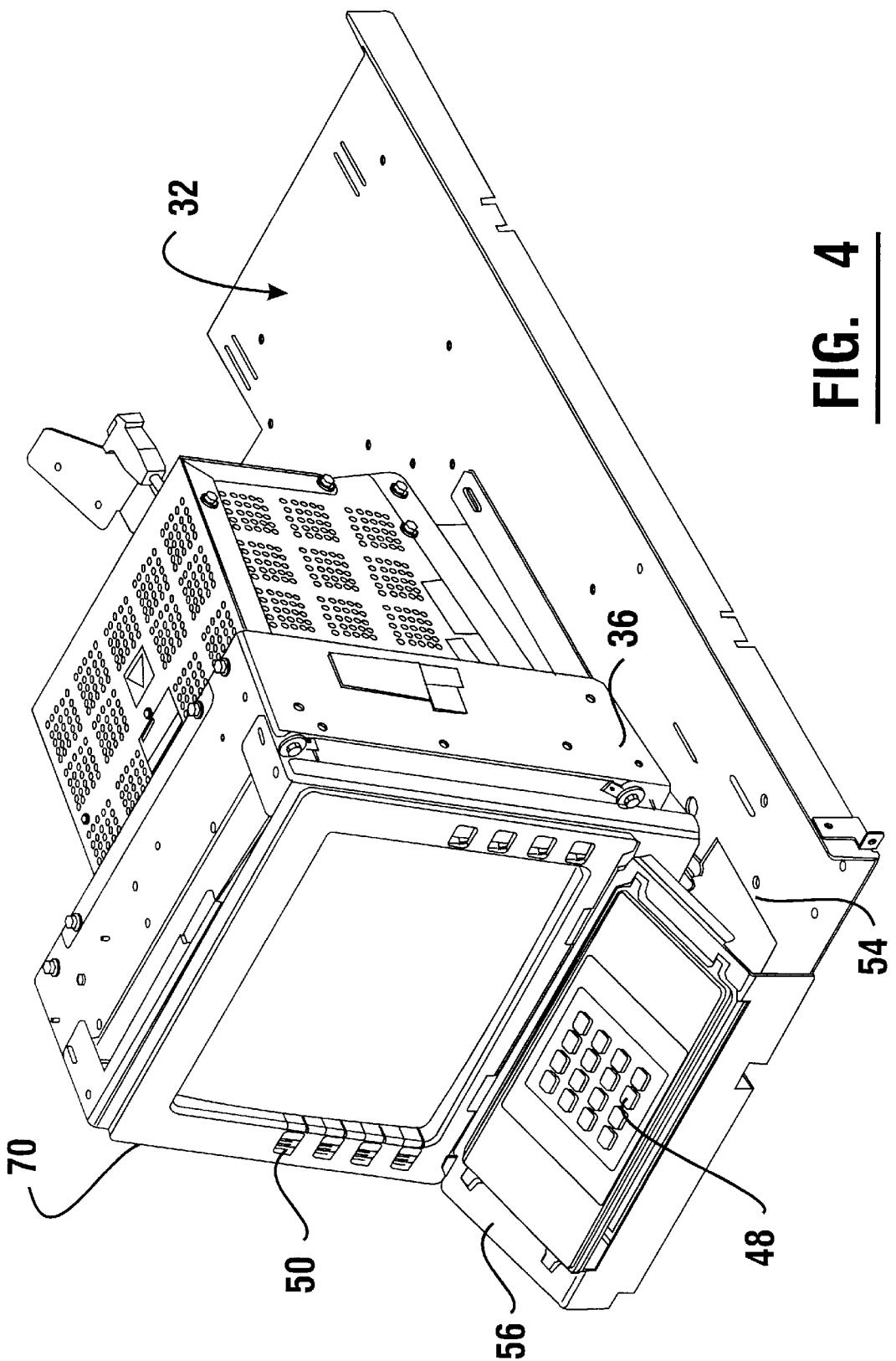


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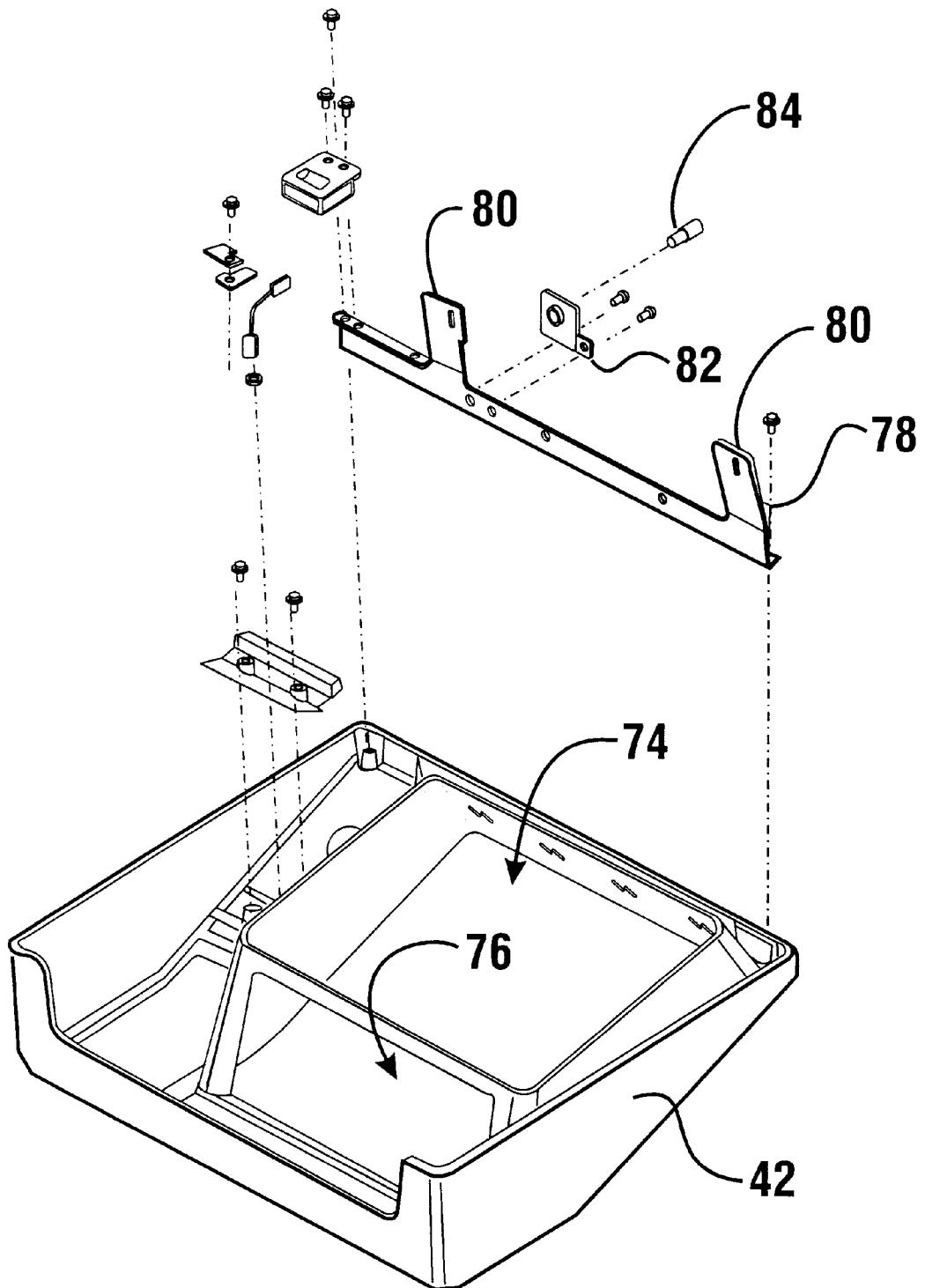


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**FIG. 5**

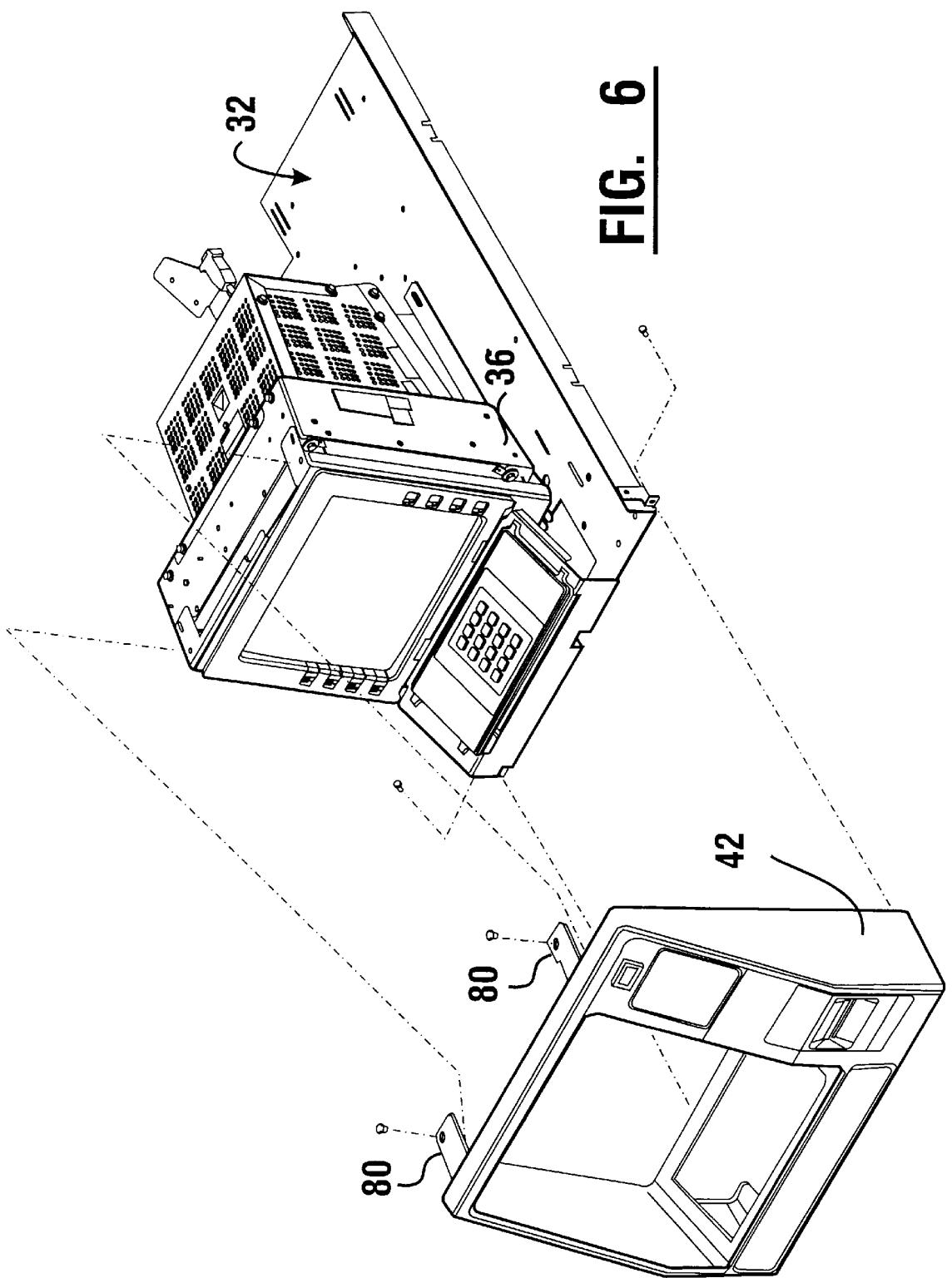
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**FIG. 6**



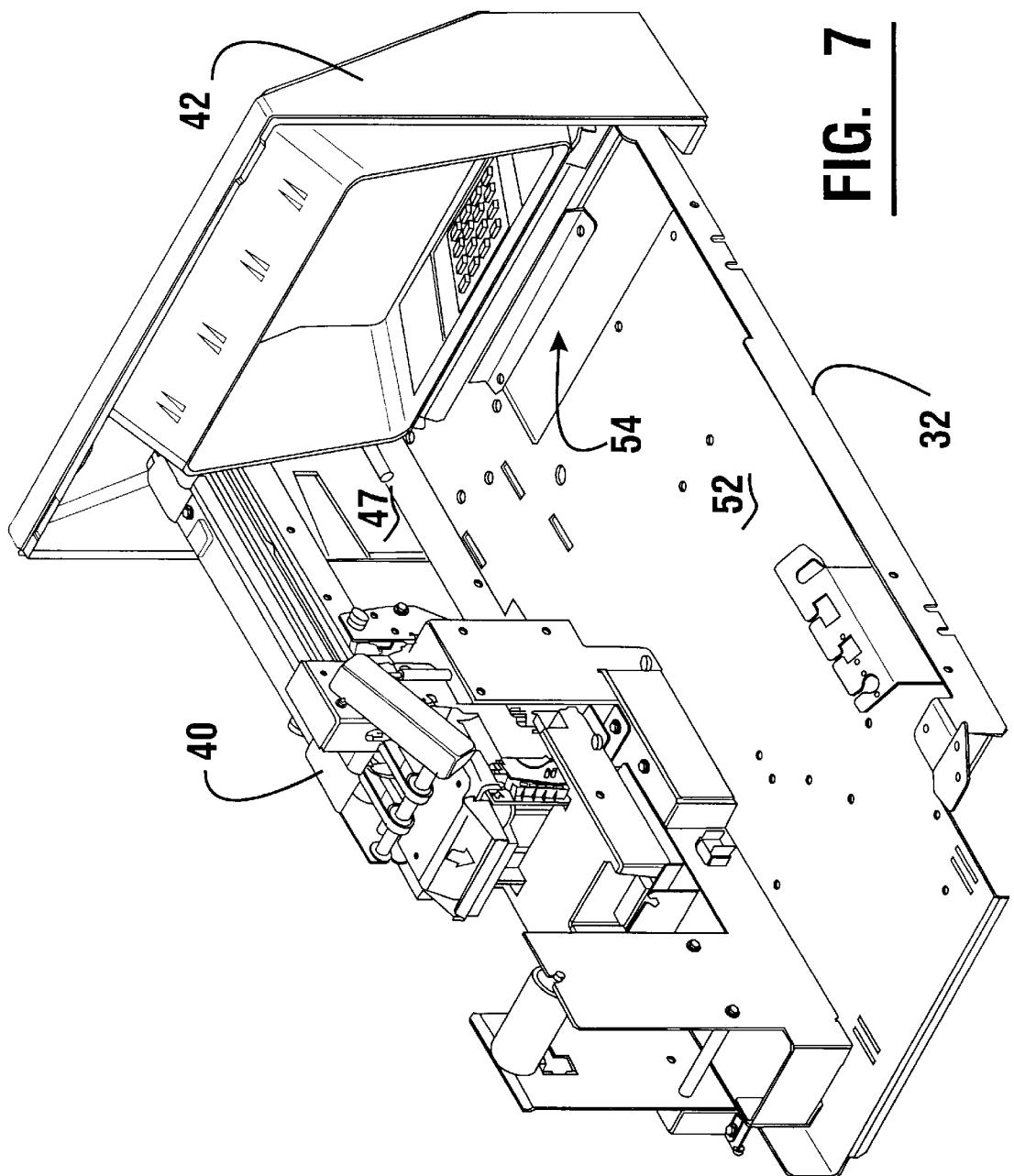
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**FIG. 7**

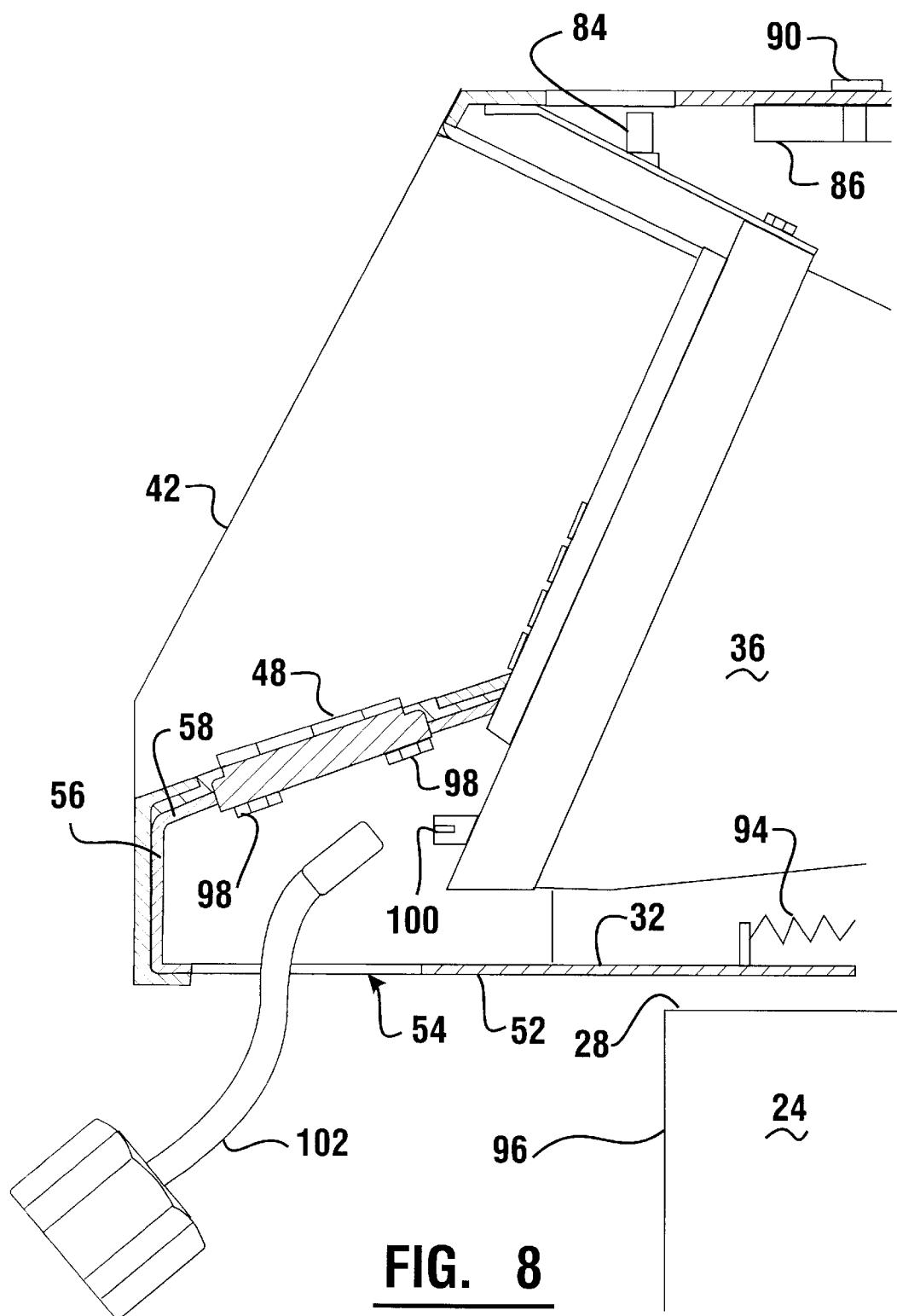


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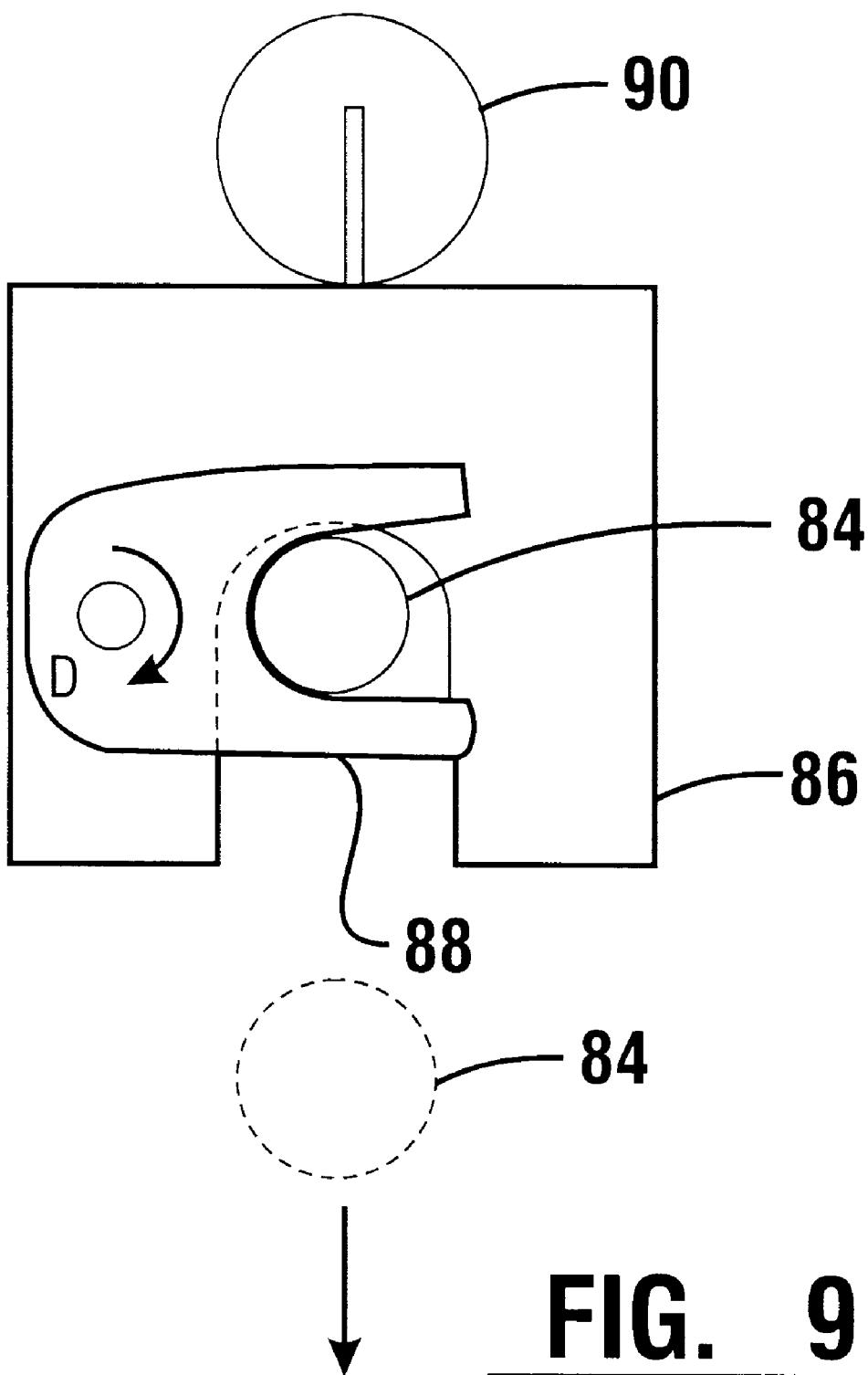


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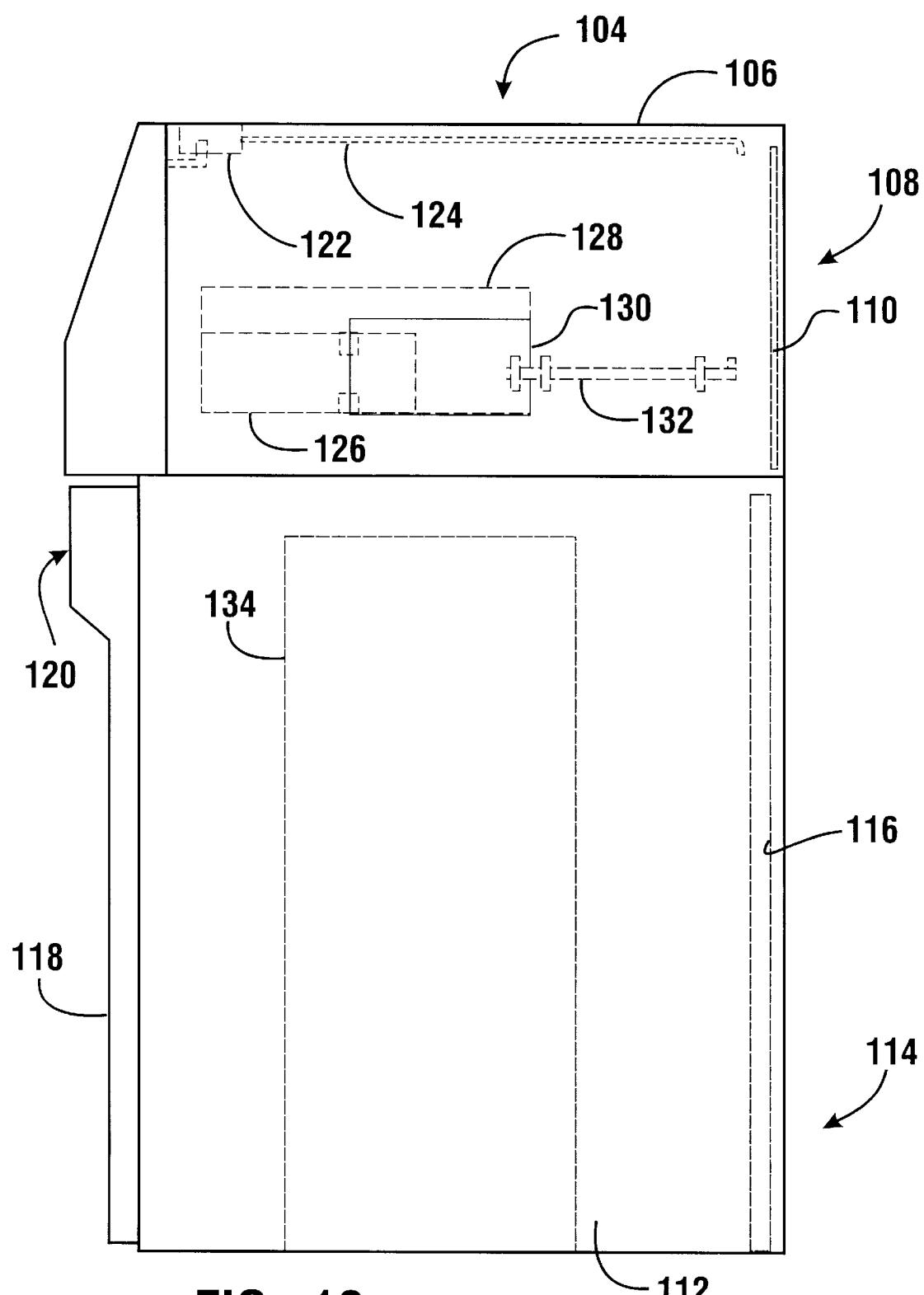


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**FIG. 10**

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**1****AUTOMATED BANKING MACHINE  
ENCLOSURE**

This application claims benefit of Provisional Appl No. 60/066,971, filed Nov. 28, 1997.

**TECHNICAL FIELD**

This invention relates to automated banking machines. Specifically this invention relates to an enclosure for an automated banking machine which is compact, but which has a large customer interface area.

**BACKGROUND ART**

Automated banking machines are well known in the prior art. A common type of automated banking machine is an automated teller machine (ATM). Automated banking machines may be used by customers to carry out banking transactions. Common banking transactions include dispensing cash, checking account balances and transferring funds between accounts. As used herein automated banking machine refers to any of the types of devices that enable carrying out transactions involving the transfer of funds or value electronically, including but not limited to ATMs, cash dispensers, credit card terminals, ticket dispensers, utility payment terminals, smart card value transfer terminals and devices that perform similar functions.

It is generally desirable to reduce the size of ATMs. This is particularly true of ATMs that are designed to be used as lobby units within the confines of a building. Most operators of facilities want an ATM to take up as little valuable floor space as possible.

Unfortunately when ATMs are made smaller there is a tendency to decrease the size of the interface area which includes components that customers use to operate the machine. Interface areas typically include a display which serves as an output device for providing messages to customers. The interface area of an ATM also generally includes a keypad and/or function buttons which serve as input devices. If the size of an interface area is reduced these components must become smaller. This can make the machine more difficult to operate.

Thus there exists a need for an automated banking machine which has a reduced size but which includes a large customer interface that is easy to operate.

**DISCLOSURE OF INVENTION**

It is an object of the present invention to provide an automated banking machine.

It is a further object of the present invention to provide an automated banking machine which has a relatively small size.

It is a further object of the present invention to provide an automated banking machine which is more readily serviced.

It is a further object of the present invention to provide an automated banking machine that provides a secure enclosure for critical components and valuable documents.

It is a further object of the present invention to provide an automated banking machine that has an attractive appearance.

It is a further object of the present invention to provide a method of operating an automated banking machine.

Further objects of the present invention will be made apparent in the following Best Modes for Carrying out Invention and the appended claims.

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The foregoing objects are accomplished in a preferred embodiment of the invention by an automated banking machine which includes a housing bounding an interior area. The interior area has a first opening. The housing is mounted above a chest which houses critical components and valuable documents.

A rollout tray is movably mounted on the housing. The rollout tray is movable between a first position in which it extends outward from the housing, and a second position in which it is retracted into the interior area of the housing. The rollout tray has serviceable components thereon. The serviceable components include a display and a keypad.

The rollout tray includes a lower wall which has a service opening therein. The service opening is accessible from underneath the lower tray when the tray is in the extended position. An upper wall is supported on the rollout tray and extends above the service opening. The keypad is supported on the upper wall. Service points on the keypad are accessible through the service opening and the keypad is enabled to be removed from the machine by passing it through the service opening. The display includes at least one image adjusting knob. The image adjusting knob is disposed between the upper wall and the lower wall. The image adjusting knob is enabled to be accessed through the service opening when the rollout tray is in the extended position.

When the rollout tray is in the retracted position the service opening is not accessible from outside the housing. The rollout tray is biased outwardly but is selectively held in the retracted position by a lock. Releasing the lock causes the rollout tray to move outward so that the service opening is accessible from outside the housing of the machine.

The rollout tray further supports at least one device that retracts an item presented to, or provided by the customer, such as a invalid credit or debit card, or a card or transaction receipt, ticket, cash or other item not taken by the customer upon completion of the transaction. The item is retracted by the device and stored in an area of the device. An access door on the machine may be opened by authorized persons to remove items from the area when the rollout tray is in the retracted position. Alternatively, the rollout tray and the device may be moved outwardly so that the items can be removed from the area from outside the housing.

**BRIEF DESCRIPTION OF DRAWINGS**

FIG. 1 is an isometric view of an automated banking machine of a preferred embodiment of the invention with a rollout tray extended and a secure chest in an open condition.

FIG. 2 is an isometric exploded view of the rollout tray and keypad mounting.

FIG. 3 is an isometric exploded view of the rollout tray, a display and its mounting.

FIG. 4 is an isometric view of the display and keypad in an assembled condition.

FIG. 5 is an isometric exploded back view of a fascia of the machine and locking hardware mounted thereon.

FIG. 6 is an exploded view showing the mounting of the fascia to the rollout tray.

FIG. 7 is an isometric rear view of the fascia, keypad and a receipt printer of the automated banking machine.

FIG. 8 is a side cross-sectional view of the rollout tray in an extended position and a tool used to access service points through the service opening.

FIG. 9 is a schematic view of a locking mechanism used to lock the rollout tray in a retracted position.

FIG. 10 is a side schematic view of alternative form of an automated banking machine shown installed in a counter or teller line.

#### BEST MODES FOR CARRYING OUT INVENTION

Referring now to the drawings and particularly to FIG. 1 there is shown therein an automated banking machine of a first preferred embodiment of the present invention generally indicated 10. Automated banking machine 10 is an automated teller machine (ATM). Machine 10 includes a housing 12. Housing 12 includes sidewalls 14 and 16, and a top wall 18. Housing 12 encloses an interior area indicated 20. Housing 12 has an opening 22 at the front thereof. In the first embodiment the rear of housing 12 is closed by a rear wall not shown. However in other embodiments of the invention the rear of housing 12 may be accessible through an access door or similar device.

ATM 10 further includes a chest 24. Chest 24 encloses a secure area 26. Secure area 26 is used in the preferred embodiment to house critical components and valuable documents. Specifically in the preferred embodiment secure area 26 is used for housing currency and currency dispensers. Chest 24 includes an upper wall 28 at the top thereof. Housing 12 is supported on upper wall 28 of the chest. Chest 24 also includes a chest door 30. Chest door 30 which is shown in the open condition in FIG. 1, is generally closed to secure the contents of the chest. Chest door 30 includes a lock, boltwork and a deadbolt which are used to selectively secure door 30 in the closed position. In the embodiment shown the chest door is used to close an opening positioned at the front of the chest. In other embodiments the chest opening and door may have other configurations. The chest door includes an opening therethrough and cooperates with mechanisms inside and outside the chest for passing currency or other items between a customer and devices located inside the chest.

Machine 10 further includes a rollout tray 32 (see FIGS. 2 and 3). Rollout tray 32 is movably mounted on slides 34. The slides enable moving the rollout tray from the extended position shown in FIG. 1 to a retracted position within the interior area of the housing.

Rollout tray 32 preferably has several banking machine components supported thereon. A display 36 is supported on the tray. The display 36 in the preferred embodiment is a CRT which includes screen 38. A receipt printer 40 is also supported on the rollout tray. The receipt printer 40 is used for printing paper receipts that are delivered to customers who operate the machine 10. The receipt printer is preferably attached to a delivery and retraction mechanism of the type shown in U.S. patent application Ser. No. 08/827,567 filed Mar. 28, 1997 the disclosure of which is incorporated herein by reference. This device includes a mechanism for retracting receipts that are presented to a customer, but which are not taken.

A fascia 42 is also supported on the rollout tray. The fascia includes an opening 44 through which receipts are delivered to customers. The fascia further includes a card opening 46 through which a customer operating the machine may insert their card. Card opening 46 is connected to a card reader 47 which is also supported on the rollout tray (see FIG. 7). In the preferred embodiment the card reader is of the type that is capable of reading cards such as debit, credit and/or smart cards, and is capable of capturing and holding invalid or expired cards, and/or cards that are not taken by customers after completing their transactions. A keypad 48 is also

supported on the rollout tray and is accessible through the fascia. A plurality of function buttons 50 are positioned adjacent to the screen 38.

The keypad 48, function buttons 50 and screen 38 provide an interface area for customers operating the machine. Customers respond to prompts and other messages presented by the machine by giving inputs through the keypad and the function buttons. It is a fundamental advantage of the preferred embodiment of the present invention that the screen and interface area of the ATM is relatively large compared to the overall size of the ATM.

As shown in FIG. 2, rollout tray 32 has a lower wall 52. A service opening 54 extends through the lower wall adjacent to the outer portion thereof. Tray 32 further includes an upward extending wall portion 56 and an upper wall 58 (see FIG. 8). Upper wall 58 overlies the service opening 54.

As shown in FIG. 2, upper wall 58 includes a keypad mounting opening 60 therein. A keypad mounting plate 62 attaches to the upper wall 58 through a tab and slot arrangement. The keypad 48 is accepted in an opening in the keypad mounting plate 62 from underneath. As shown in FIGS. 2 and 8, keypad 48 includes an inwardly disposed flange which prevents it from passing through the opening in the keypad mounting plate. A keypad securing plate 64 is positioned below the keypad and the keypad mounting plate, and is secured to the keypad mounting plate by fasteners. This holds the keypad in position in the opening in the keypad mounting plate. It also enables the keypad to be released by loosening the fasteners which hold the keypad securing plate. The keypad 48 is connected to a releasable electrical connector 66 which is attachable to other circuitry in the automated banking machine.

FIG. 3 shows the manner in which the display 36 is supported on the rollout tray 32. A monitor mounting bracket 68 is attached to the rollout tray and to the display with fasteners. A surround plate 70 is also attached to the display 36 and the rollout tray. It should be noted that the surround plate attaches to the rollout tray in the inward direction relative to service opening 54. Surround plate 70 also includes a lower recess 72. As later discussed in detail, the lower recess enables image adjusting knobs which are positioned in the lower front area of the display 36 to be accessed through the service opening 54. FIG. 4 shows the components in FIG. 3 in an assembled condition.

FIG. 5 shows the interior of fascia 42. Fascia 42 includes a screen opening 74 which enables viewing screen 38 of display 36. Fascia 42 further includes a keyboard opening 76. Keyboard opening 76 extends in a wall which overlies upper wall 58 and keyboard mounting plate 62 when the fascia is in the operative position.

A mounting bar 78 is attached at two locations adjacent to the top of fascia 42. Mounting bar 78 includes a pair of tabs 80. As shown in FIG. 6, tabs 80 are used to attach the mounting bar and the fascia to the surround plate and the display 36.

A locking pin support bracket 82 is attached to mounting bar 78 by fasteners. Support bracket 82 has mounted thereto a locking pin 84. As later discussed, locking pin 84 engages a pawl of a lock which selectively operates to hold the rollout tray 32 in a retracted position in the machine.

In the operative position of machine 10 the rollout tray 32 is retracted into the interior area 20 of the housing 12. In this position the inside perimeter surface of the fascia 42 is in adjacent close relation with the surfaces of walls 14, 16 and 18 bounding opening 20. The lower wall 52 of rollout tray 32 including service opening 54, is positioned above and in

close fitting relation with upper wall 28 of the chest 24. As a result opening 54 cannot be accessed from outside the housing in this position.

The locking pin 84 in the retracted position of the rollout tray is accepted into a recess of a lock 86 as shown in FIG. 9. The locking pin 84 when positioned in the recess may be releasably held by a pawl 88. Pawl 88 may be selectively held in engagement with pin 84 as shown in FIG. 9 to hold rollout tray 32 in the retracted position. Lock 86 is in operative connection with a key cylinder 90. Key cylinder 90 is moved to lock and release the pawl of lock 86. Key cylinder 90 is moved using a key 92 as shown in FIG. 1. When pin 84 is released by the lock it is enabled to move in a forward direction as indicated in phantom in FIG. 9.

The slides 34 on which rollout tray 32 is mounted to the housing are preferably biased outward by springs. This is schematically indicated by spring 94 in FIG. 8. As a result when the lock 86 is changed from the condition in which it holds the locking pin 84, to a condition in which it releases the locking pin, the rollout tray moves forward as represented in FIG. 8. As the rollout tray 32 moves forward, service opening 54 moves outward beyond a face 96 of chest 24. In this position the service points which are located between lower wall 52 and upper wall 58 may be accessed through opening 54 from underneath. In the embodiment shown the service points include fasteners 98 holding the keypad in position. The removal of fasteners 98 which hold the keypad securing plate 64 enables the keypad to be disengaged from the upper wall. The keypad may be disconnected electrically and removed from the machine through the service opening 54. The keypad may thereafter be subsequently replaced with another keypad. This facilitates replacing a keypad which has worn out or malfunctioned.

Display 36 includes image adjusting knobs 100. The image adjusting knobs are used to adjust the picture provided by the display. Typically such adjustments include brightness, contrast and hue, for example. The image adjusting knobs in the preferred embodiment are accessible through the lower recess 72 in the surround plate 70, which enables them to be accessed through the service opening 54.

FIG. 8 shows a tool 102 with a flexible stem which includes an aperture or recess for accepting the image adjusting knobs therein. Such a tool enables turning the adjusting knobs when the tool is extended upwardly through the service opening 54. Of course other tools may be used for purposes of contacting and moving service points such as fasteners 98 and knob 100.

The service access opening in the lower wall of the rollout tray enables the components of the interface area of ATM 10 to be compactly positioned while still providing a large interface area for the machine. The construction of the preferred embodiment further provides resistance to tampering as the service opening 54 is rendered inaccessible when the rollout tray is retracted into the machine. Of course in other embodiments other arrangements may be used to provide such an improved customer interface while achieving enhanced service access.

Of course it should be understood that rollout tray 32 may be extended to the degree necessary for a service person to work on all of the components supported thereon as shown in FIG. 1. The preferred embodiment renders the components supported on the tray readily accessible. This includes accessing areas where cards captured by the card reader, as well as areas where retracted receipts or other items are stored, so that such items may be accessed from outside the

housing and removed. Repair or replacement of components supported on the rollout tray may be accomplished quickly and easily. If it is desired to replace an entire assembly, the complete tray may be removed and another tray with components thereon substituted.

When servicing is completed the rollout tray may be moved into the machine until the locking pin 84 engages the lock 86. In this position the machine is ready for operation by customers.

An alternative embodiment of an automated banking machine generally indicated 104 is shown in FIG. 10. Machine 104 is similar to machine 10 except as otherwise indicated.

Machine 104 has a housing 106 which is similar to housing 12. However housing 106 differs from housing 12 in that it includes a rear opening 108 that can be accessed through a rear door 110. Rear door 110 preferably has a locking device (not shown) in operative connection therewith which is used for restricting access to the interior area of the housing to authorized persons.

Machine 104 also includes a secure chest 112 similar to chest 24. Chest 112, unlike chest 24, has a rear opening 114. Access to the interior area of the chest is controlled by a chest door 116. Chest door 116 includes a suitable locking mechanism for restricting access thereto, like that used in the first embodiment. Chest 112 includes a generally fixed front panel 118. Front panel 118 has a delivery area 120 thereon through which currency or other items may be passed to and from mechanisms housed within the chest. As in the case with machine 10, this is done through an opening using mechanisms that pass currency or other items through the opening.

Housing 106 differs from housing 12 in that it includes a locking mechanism 122. Unlike lock 86, locking mechanism 122 may be unlocked by moving a lever 124 which is accessible in the interior area of housing 12, located preferably just inside opening 108. As a result, once door 110 has been opened, lever 124 can be moved to unlock the lock 122. This enables the front fascia and the roll out tray to be moved forward in the manner of the previously described embodiment. This enables servicing the components from the front of the machine. In alternative embodiments lock 122 may be in connection with a key cylinder to enable unlocking either from the front of the machine using a key, or from the rear of the machine using lever 124 once door 110 has been opened.

Like the previously described embodiment, machine 104 includes a card reader, which is schematically indicated 126. Machine 104 also preferably includes a mechanism like the first embodiment that delivers receipts or other papers to customers, and in some selected circumstances retracts the receipts or other papers back into the machine. The receipt delivery and retraction mechanism is schematically indicated 128 in FIG. 10.

Machine 104 includes a side door 130 on housing 106. Side door 130 is preferably mounted on hinges and is movable to enable access through an opening in the side wall of the housing. Door 130 is normally held in a closed condition by a locking mechanism. The locking mechanism can be actuated by a lever 132 inside housing 106.

Side door 130 is preferably positioned so that when it is opened, and the roll out tray is in the retracted position, the card reader 126 and the receipt retraction mechanism 128 may be accessed through the opening. Preferably, with door 130 open, a service person is enabled to access the area of the card reader where captured cards are held. Such captured

cards are those retained by the machine in an area in or in connection with the card reader. Such cards may include for example invalid cards, cards reported stolen or cards that a user forgot to take when they completed their transactions. Opening side door **130** enables a serviceperson to remove such cards.

Side door **130** also enables a serviceperson to gain access to receipt or other papers that were not taken by customers, and which were retracted by mechanism **128** back into a storage area. The serviceperson may remove these receipts with door **130** open. Once retained cards and retracted receipts are removed, door **130** may be closed and secured. In the embodiment shown door **130** may be opened only by actuating a lever located inside the housing which reduces the risk of unauthorized access. In other embodiments door **130** may be controlled by a key or other type lock that can be actuated from the exterior of the housing with a key or by other methods. In still other embodiments door **130** may be opened separately by each of an actuator inside the housing and an externally actuatable key lock or another type lock.

Machine **104** may be installed through a counter **134**. Counter **134** may be for example a service counter or a bank teller line. Machine **104** could be installed in or adjacent to a bank teller station. In this configuration most routine servicing of the machine may be done by personnel located behind the counter **134**. Such activities may include replenishing cash for delivery to customers, which may be accomplished after opening chest door **116**. Similarly replenishment of paper supplies for printing receipts and a journal of transactions may preferably be accomplished after opening door **110**. Captured cards and retracted receipts are also preferably accessible by a service person standing behind counter **134** once door **130** is open. Of course these same functions can also be accomplished from the front of the machine by moving the fascia and roll out tray outward in the manner previously described, after unlocking lock **122**. Of course additional servicing activities may be accomplished by accessing components on the roll out tray.

While the preferred embodiments of the invention include particular structures to achieve the desirable results, those having skill in the art may devise numerous other embodiments with other structures which employ the same inventive principles described herein and which are encompassed by the subject matter as claimed. Further, while cards and receipts are described as items which are taken from customers or retracted by the machine and held in storage, in other embodiments other types of items such as tickets, cash, vouchers, travelers checks, coupons and similar items may be retracted, stored and accessed by authorized persons.

Thus the preferred embodiment of the present invention achieves the above stated objectives, eliminates difficulties encountered in the use of prior devices, solves problems and attains the desirable results described herein.

In the foregoing description certain terms have been used for brevity, clarity and understanding. However no unnecessary limitations are to be implied therefrom because such terms are for descriptive purposes and are intended to be broadly construed. Moreover the descriptions and illustrations herein are by way of examples and the invention is not limited to the exact details shown and described.

In the following claims any feature described as a means for performing a function shall be construed as encompassing any means capable of performing the recited function, and shall not be deemed limited to the particular means shown as performing that function in the foregoing description or mere equivalents thereof.

Having described the features, discoveries and principles of the invention, the manner in which it is constructed and operated, and the advantages and useful results attained; the new and useful structures, devices, elements, arrangements, parts, combinations, systems, operations, methods and relationships are set forth in the appended claims.

We claim:

1. An automated banking machine apparatus comprising:  
a housing bounding an interior area, the housing having a first opening to the interior area;  
a rollout tray movably supported on the housing, the rollout tray including a wall portion, a service opening extending through the wall portion, wherein the rollout tray is movable between a first position wherein the tray extends outward from the first opening and the service opening is accessible from outside the housing, and a second position wherein the tray is within the interior area and the service opening is not accessible from outside the housing;
- a first serviceable component mounted in supporting connection with the tray and overlying the service opening, the serviceable component having a service point, and wherein the service point is accessible from outside the housing by extending a tool upwardly through the service opening when the tray is in the first position.
2. The apparatus according to claim 1 wherein the tray includes a lower wall, and wherein the service opening extends through the lower wall.
3. The apparatus according to claim 1 wherein the first serviceable component includes a display and wherein the service point comprises an image adjusting knob of the display.
4. The apparatus according to claim 3 and further comprising a removable keypad, wherein the removable keypad overlies the service opening in an operative position of said keypad, and wherein the keypad is removable through the service opening when the tray is in the first position.
5. The apparatus according to claim 1 wherein the first serviceable component includes a keypad, wherein the keypad overlies the service opening in an operative position of the keypad, and wherein the keypad is removable through the service opening when the tray is in the first position.
6. The apparatus according to claim 1 and further comprising an upper wall in supporting connection with the tray, the wall disposed above the service opening, wherein the service point is disposed between the wall and the service opening.
7. The apparatus according to claim 6 wherein the first serviceable component includes a keypad, wherein when the keypad is in an operative position the keypad is in supporting connection with the upper wall, and wherein the keypad is removable through the service opening when the tray is in the first position.
8. The apparatus according to claim 7 wherein the upper wall includes an access opening, and wherein the keypad extends through the access opening in the operative position.
9. The apparatus according to claim 7 and further comprising a display, the display mounted in supporting connection with the tray, wherein the display includes an image adjustment knob, and wherein the image adjustment knob is disposed below the upper wall.
10. The apparatus according to claim 1 and further comprising a fascia in supporting connection with the tray, and wherein the fascia covers the first opening when the tray is in the second position.
11. The apparatus according to claim 10 and further comprising a spring biasing the tray towards the first

position, and a lock enabling selectively holding the tray in the second position, wherein upon releasing the lock the tray moves from the second position, whereby the fascia is disposed from the first opening upon release of the lock.

**12.** The automated banking machine according to claim **10** wherein the housing further includes a second opening, and an access door movably mounted relative to the housing, wherein the access door is selectively movable between a closed position wherein the access door closes the second opening and an open position wherein the access door is disposed away from the second opening, and further comprising a lock in the interior area of the housing, wherein the lock enables selectively housing the tray in the second position, or releasing the tray to move to the first position, and further comprising an actuating lever in the interior area of the housing, wherein the lever is in operative connection with the lock, and wherein movement of the lever is operative to release the tray and move it toward the first position.

**13.** The automated banking machine according to claim **12** and further comprising a lock actuator, wherein the lock actuator is in operative connection with the lock and is accessible from an exterior area of the housing, and wherein operation of the lock actuator is operative to release the tray to move toward the first position, wherein the tray may be released to move to the first position by either actuation of the actuator or movement of the lever.

**14.** The automated banking machine according to claim **13** wherein the lock actuator includes a key cylinder, and wherein the lock actuator is selectively actuatable by a key.

**15.** The automated banking machine according to claim **14** wherein the card reader device includes a capture area in which captured cards are held, and wherein the capture area is accessible through the housing service opening when the rollout tray is in the second position, and the capture area is accessible from outside the housing when the rollout tray is moved to the first position.

**16.** The apparatus according to claim **1** wherein the machine further comprises a chest positioned below the interior area, and wherein the service opening is disposed outward and above the chest when the tray is in the first position.

**17.** The apparatus according to claim **16** wherein the interior area is disposed above the chest.

**18.** The automated banking machine according to claim **1** and further comprising a card reader device in supporting connection with the rollout tray, and further comprising a housing service opening in the housing, and further comprising a service door movably mounted relative to the housing and selectively movable between a covering position wherein the service door blocks access through the housing service opening, and an uncovering position wherein the interior area of the housing is accessible through the housing service opening, and further comprising a locking mechanism selectively holding the service door in the covering position, and wherein when the rollout tray is in the second position the card reader device is positioned adjacent to the housing service opening and is accessible through the housing service opening when the service door is in an uncovering position, and wherein when the rollout tray is moved to the first position the card reader device is accessible from outside the housing.

**19.** The automated banking machine according to claim **1** and further comprising a receipt retraction mechanism in supporting connection with the rollout tray, and further comprising a housing service opening in the housing, and further comprising a service door movably mounted relative to the housing and selectively movable between a covering

position wherein the service door blocks access through the housing service opening and an uncovering position wherein the interior area of the housing is accessible through the housing service opening, and further comprising a locking mechanism selectively holding the service door in the covering position, and wherein when the rollout tray is in the second position the receipt retraction mechanism is positioned adjacent to the housing service opening and is accessible through the housing service opening when the service door is in the uncovering position, and wherein when the rollout tray is moved to the first position the receipt retraction mechanism is accessible from outside the housing.

**20.** A method comprising the steps of:

extending a rollout tray from a housing of an automated banking machine, the rollout tray having a lower wall portion with a service opening extending therethrough and having a serviceable component supported by the tray, wherein the service opening becomes accessible by a tool from outside the housing when the tray is extended; and

accessing a service point on the serviceable component by extending the tool upwardly through the service opening.

**21.** The method according to claim **20** wherein the serviceable component comprises a display, and wherein the service point comprises an image adjusting knob on the display, and further comprising the step of moving the image adjusting knob with the tool.

**22.** The method according to claim **20** wherein the rollout tray has an upper wall supported thereon, and wherein the upper wall overlies the service opening, and wherein the serviceable component is supported on the upper wall, and further comprising the step of removing the serviceable component through the service opening.

**23.** The method according to claim **21** wherein the serviceable component comprises a keypad and further comprising the step of removing the keypad through the service opening.

**24.** The method according to claim **20** and further comprising prior to the extending step, the steps of:

biasing the tray toward the extending position with a biasing mechanism;

holding the tray in a retracted position in the housing by operatively engaging the tray and a locking mechanism; and

releasing the locking mechanism, wherein the tray moves responsive to the biasing mechanism.

**25.** A method comprising the steps of:

a) delivering a first item from an automated banking machine to a delivery position wherein the first item is accessible from outside a housing of the machine, the item being delivered by a device in supporting connection with a rollout tray;

b) retracting the first item with the device to a storage area located inside the housing of the machine and supported on the rollout tray; and

c) moving a service door supported on a side of the housing to open a first service opening and removing the first item from the storage area through the first service opening while the rollout tray is within the housing;

repeating steps (a) and (b) with a second item;

extending the rollout tray outward from the housing through a second opening in the housing such that the storage area is accessible from outside the housing, and

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removing the second item from the storage area when the rollout tray is extended outside the housing.

**26.** An automated banking machine apparatus comprising: a housing bounding an interior area, the housing having a first opening to the interior area;

a rollout tray movably mounted in supporting connection with the housing, the rollout tray including a service opening, wherein the rollout tray is movable between a first position wherein the tray extends outward from the first opening and the service opening is accessible from outside the housing, and a second position wherein the tray is within the interior area and the service opening is not accessible from outside the housing;

a serviceable component mounted in supporting connection with the tray, the serviceable component having a service point, and wherein the service point is accessible from outside the housing through the service opening when the tray is in the first position;

an upper wall in supporting connection with the tray, the wall disposed above the service opening, wherein the service point is disposed between the wall and the service opening.

**27.** An automated banking machine apparatus comprising: a housing bounding an interior area, the housing having a first opening to the interior area;

a rollout tray movably mounted in supporting connection with the housing, wherein the rollout tray is movable between a first position wherein the tray extends outward from the first opening and wherein a service opening is accessible from outside the housing, and a second position wherein the tray is generally within the interior area and the service opening is not accessible from outside the housing;

a serviceable component mounted in supporting connection with the tray, the serviceable component having a service point, and wherein the service point is accessible from outside the housing through the service opening when the tray is in the first position;

a fascia in supporting connection with the tray, and wherein the fascia generally covers the first opening when the tray is in the second position.

**28.** An automated banking machine apparatus comprising: a housing bounding an interior area, the housing having a first opening to the interior area;

a rollout tray movably mounted in supporting connection with the housing, wherein the rollout tray is movable between a first position wherein the tray extends outward from the first opening and wherein a service opening is accessible from outside the housing, and a second position wherein the tray is generally within the interior area and the service opening is not accessible from outside the housing;

a serviceable component mounted in supporting connection with the tray, the serviceable component having a service point, and wherein the service point is accessible from outside the housing through the service opening when the tray is in the first position;

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a spring biasing the tray towards the first position, and a lock enabling selectively holding the tray in the second position, wherein upon releasing the lock the spring is operative to cause the tray to move from the second position towards the first position.

**29.** An automated banking machine apparatus comprising: a housing bounding an interior area, the housing having a first opening to the interior area;

a rollout tray movably mounted in supporting connection with the housing, the rollout tray including a wall portion in supporting connection with the rollout tray, a service opening extending through the wall portion, wherein the rollout tray is movable between a first position wherein the tray extends outward from the first opening and the service opening is accessible from outside the housing, and a second position wherein the tray is generally within the interior area and the service opening is not accessible from outside the housing;

a serviceable component mounted in supporting connection with the tray, the serviceable component having a service point, and wherein the service point is accessible by a tool from outside the housing through the service opening when the tray is in the first position.

**30.** A method comprising the steps of:

(a) extending a rollout tray outward from a first opening of a housing of an automated banking machine, the rollout tray including a service opening, wherein an upper wall is in supporting connection with the tray and disposed above the service opening, and a serviceable component is mounted in supporting connection with the tray, the serviceable component having a service point disposed between the upper wall and the service opening; and

(b) subsequent to step (a) accessing the service point by extending a tool upward through the service opening.

**31.** A method comprising the steps of:

(a) moving a fascia of an automated banking machine outward relative to a housing of the machine, wherein the fascia is moved outward in supporting connection with a rollout tray, the rollout tray being in supporting connection with the housing, and wherein a serviceable component is mounted in supporting connection with the tray, and the tray includes a service opening to a service point on the serviceable component, and wherein the service opening is generally inaccessible from outside the housing and becomes accessible from outside the housing when the fascia is moved outward in supporting connection with the tray;

(b) subsequent to step (a) accessing the service point on the serviceable component by extending a tool upward through the service opening; and

(c) subsequent to step (b) moving the fascia toward the housing in supporting connection with the rollout tray wherein the service opening becomes inaccessible from outside the housing.

\* \* \* \* \*

# **EXHIBIT B**



US007832631B2

(12) **United States Patent**  
**Beskitt et al.**

(10) **Patent No.:** US 7,832,631 B2  
(45) **Date of Patent:** \*Nov. 16, 2010

(54) **METHOD OF READING CODED RECORDS INCLUDING MAGNETIC INDICIA ON CHECKS DEPOSITED IN AN AUTOMATED BANKING MACHINE**

(75) Inventors: **William D. Beskitt**, Canton, OH (US);  
**David A. Peters**, Tallmadge, OH (US);  
**Songtao Ma**, Wadsworth, OH (US)

(73) Assignee: **Diebold Self-Service Systems division of Diebold, Incorporated**, North Canton, OH (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 394 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: 11/983,408

(22) Filed: Nov. 8, 2007

(65) **Prior Publication Data**

US 2008/0128489 A1 Jun. 5, 2008

**Related U.S. Application Data**

(60) Provisional application No. 60/858,024, filed on Nov. 10, 2006.

(51) **Int. Cl.**  
**G07F 19/00** (2006.01)

(52) **U.S. Cl.** ..... 235/379; 235/375; 235/380

(58) **Field of Classification Search** ..... 235/375, 235/379, 380

See application file for complete search history.

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*Primary Examiner*—Daniel A Hess

*Assistant Examiner*—Paultep Savudsiphon

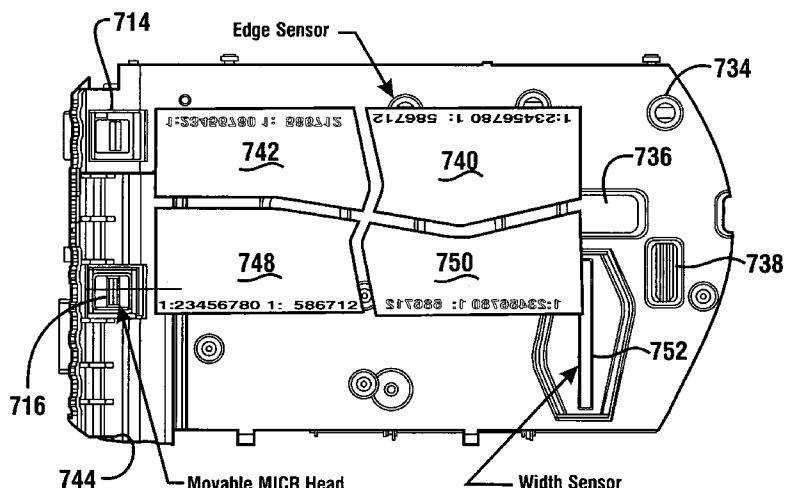
(74) *Attorney, Agent, or Firm*—Ralph E. Jocke; Daniel D. Wasil; Walker & Jocke

(57)

**ABSTRACT**

A system for sensing coded records and structures for sensing coded records are used to sense sheets including notes and checks. An automated banking machine includes a deposit accepting device. The deposit accepting device is operative to receive a stack of sheets and to separate each sheet from the stack through operation of a picker. Each sheet is aligned with the sheet path and analyzed by analysis devices including at least one magnetic read head, an imager and/or a validation device. Sheets determined not to have at least one property of a genuine sheet are returned to a user of the machine. Sheets determined to have at least one property of genuine sheets are processed and stored in the machine.

**20 Claims, 33 Drawing Sheets**



Check is aligned to edge sensors.

Width sensor determines opposite edge of check

Movable MICR head position based on width of check

MICR can be read from either side of check

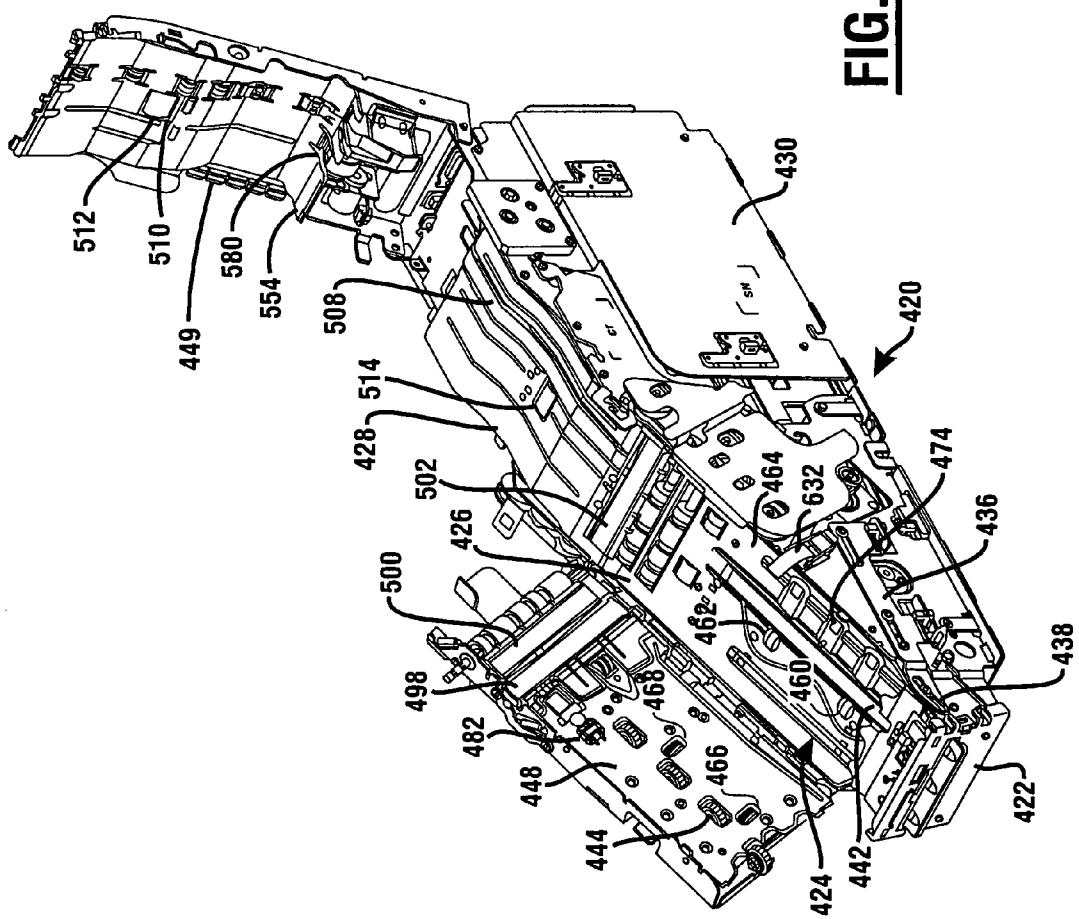
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**FIG. 1**



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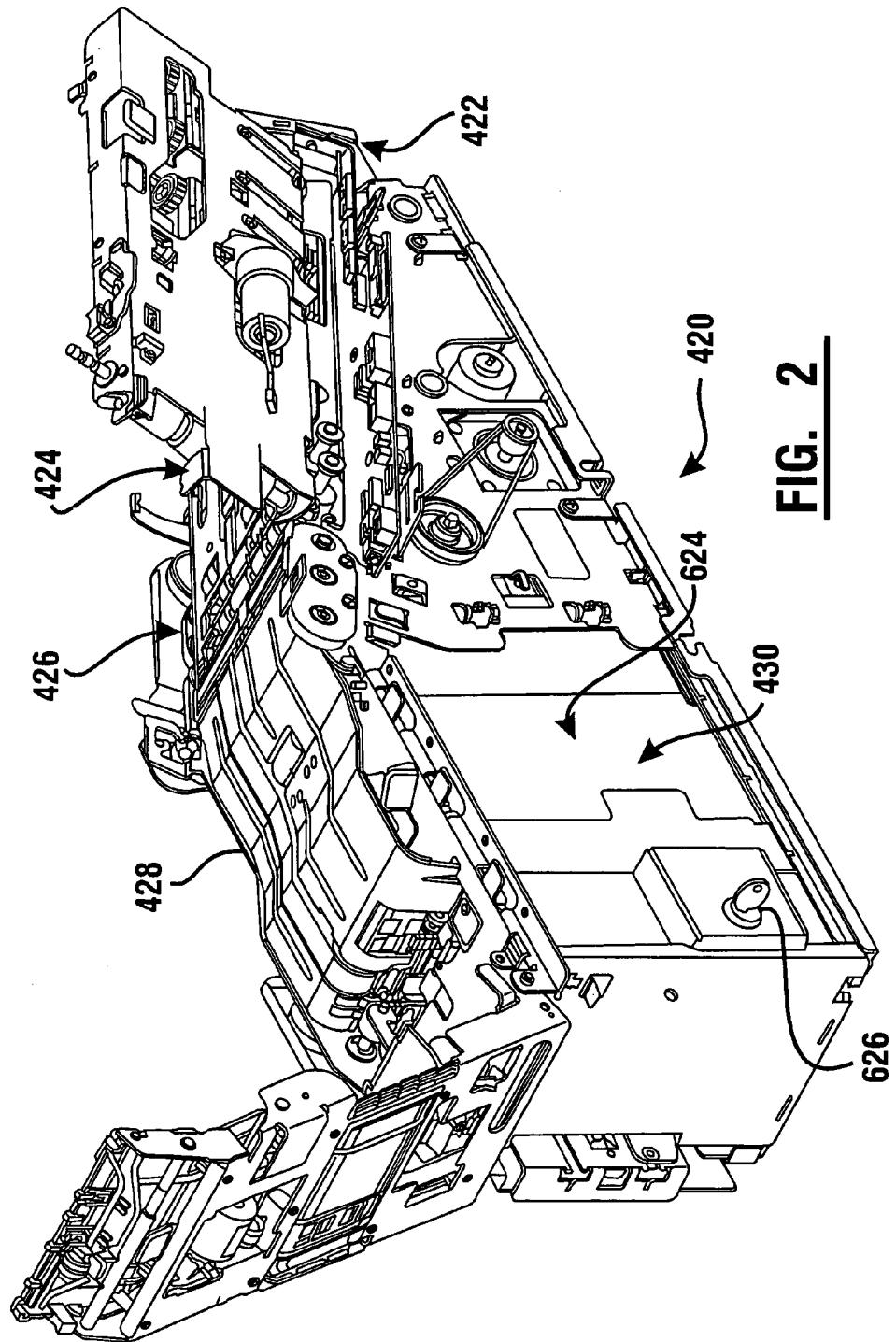


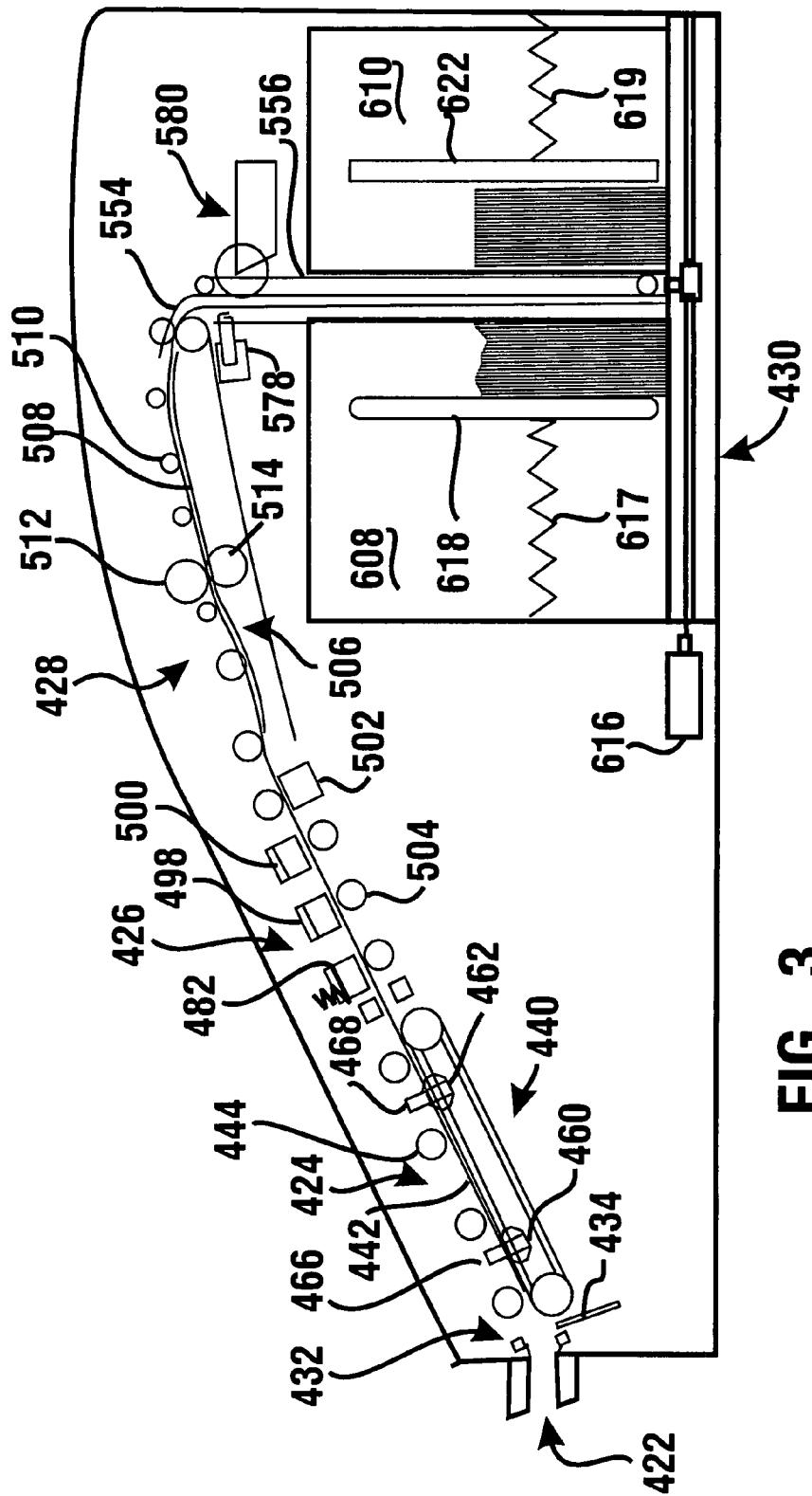
FIG. 2

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**FIG. 3**

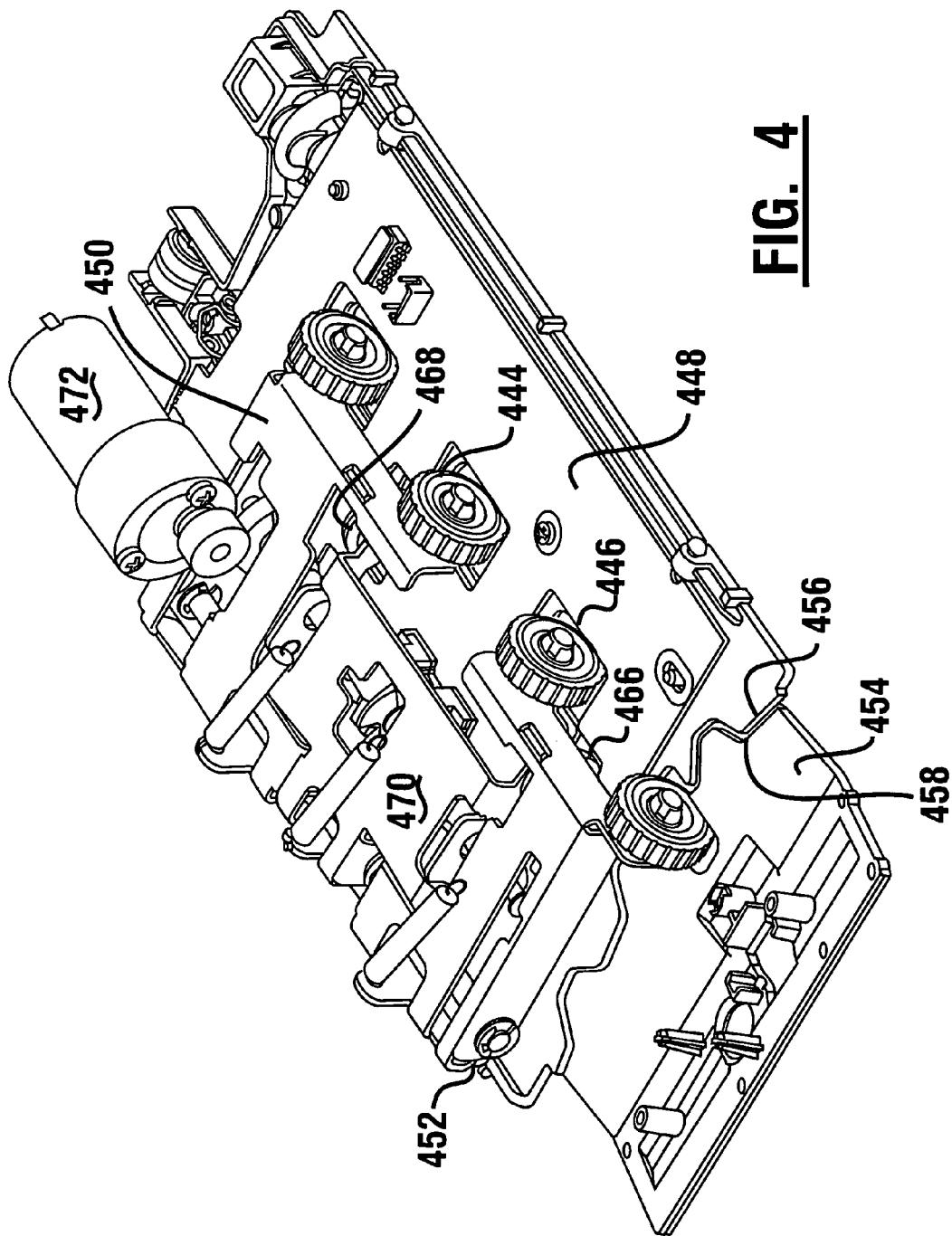
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**FIG. 4**

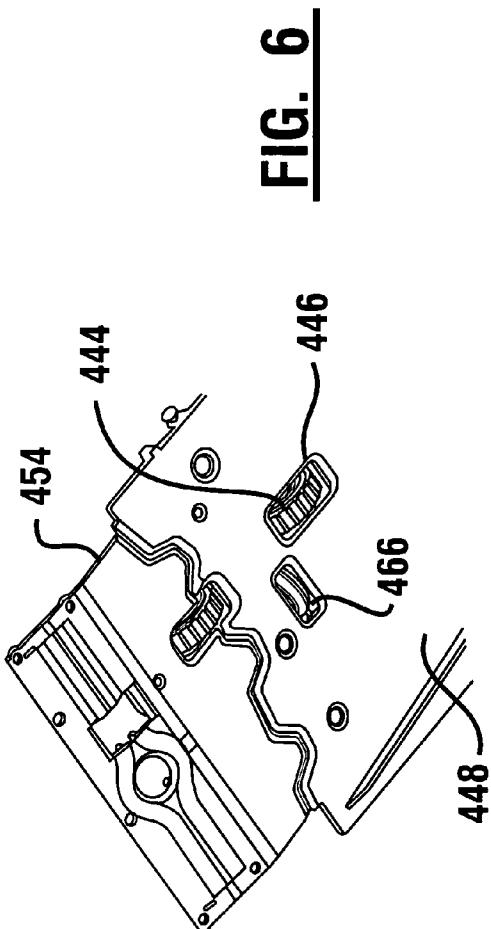
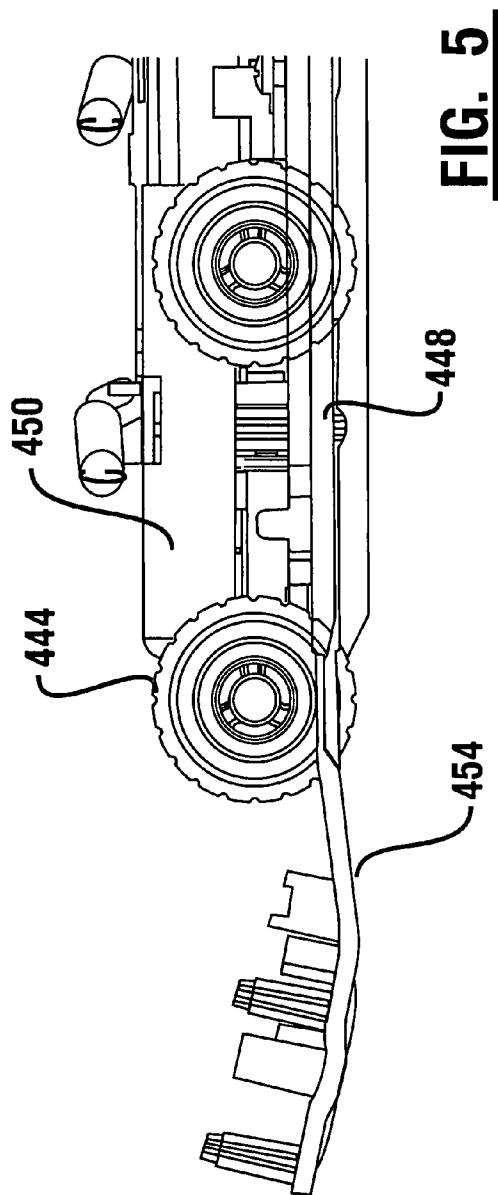


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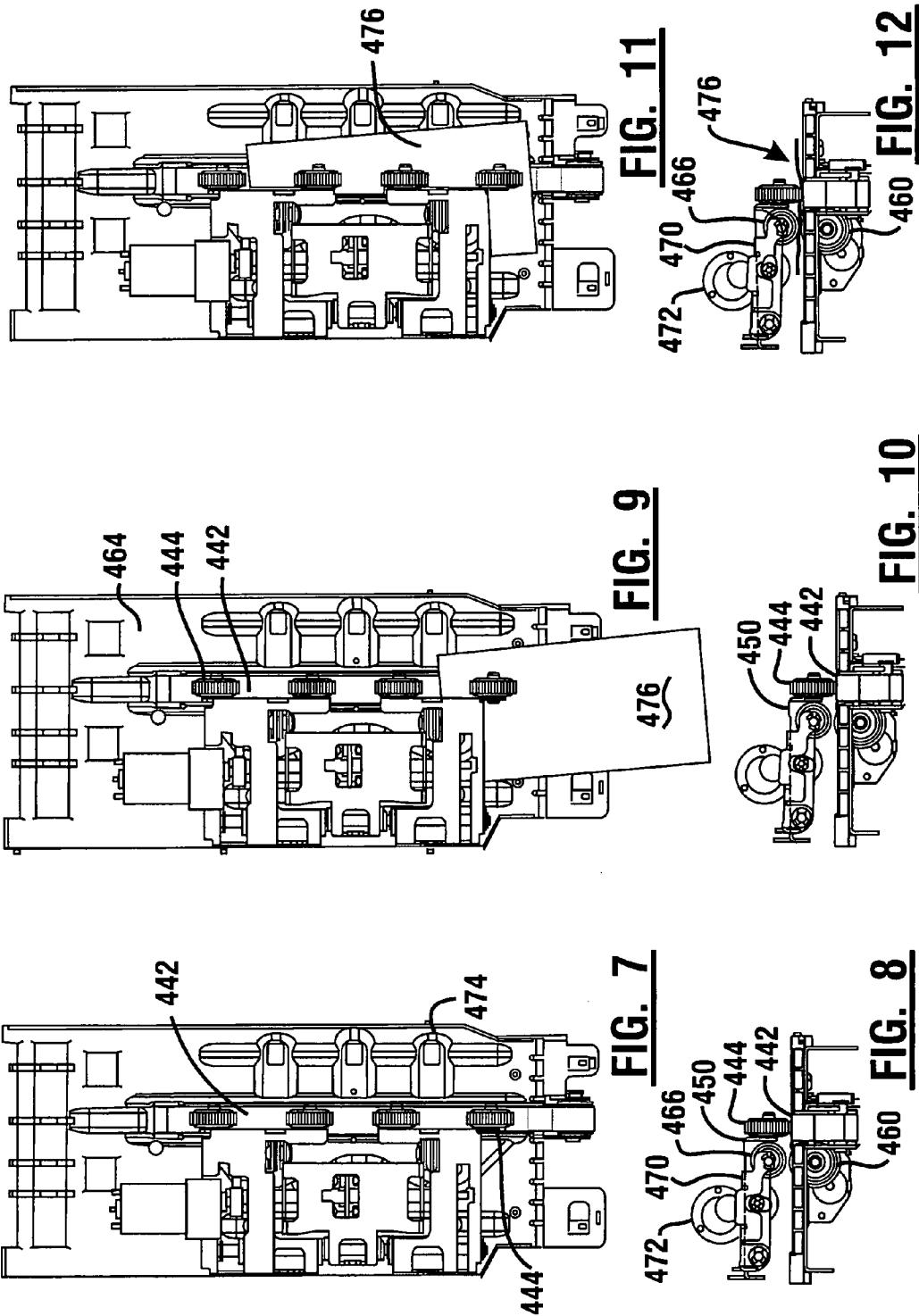


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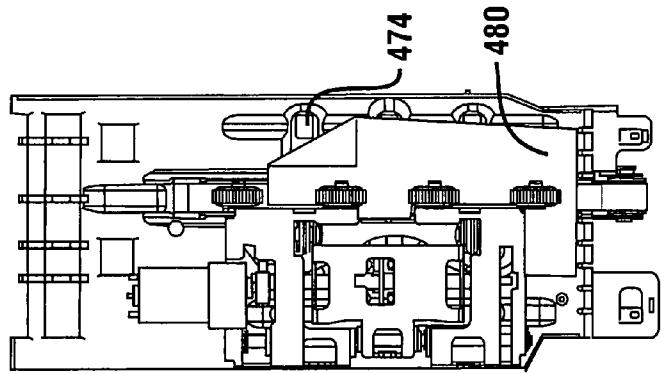


FIG. 17

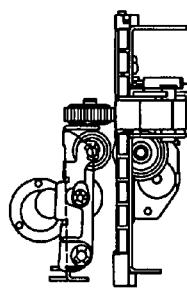


FIG. 18

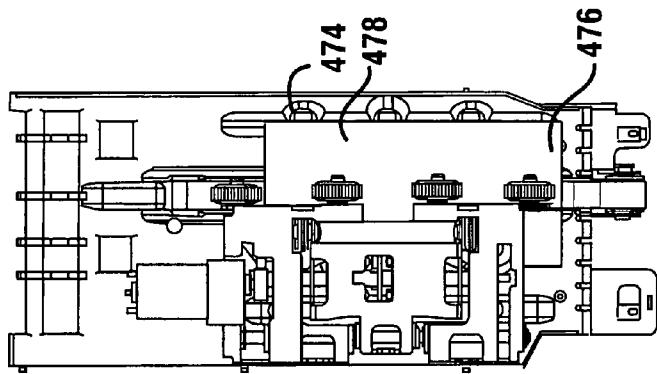


FIG. 15

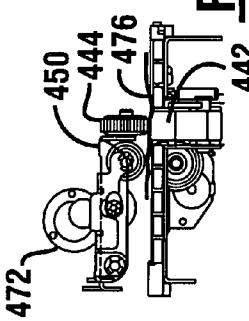


FIG. 16

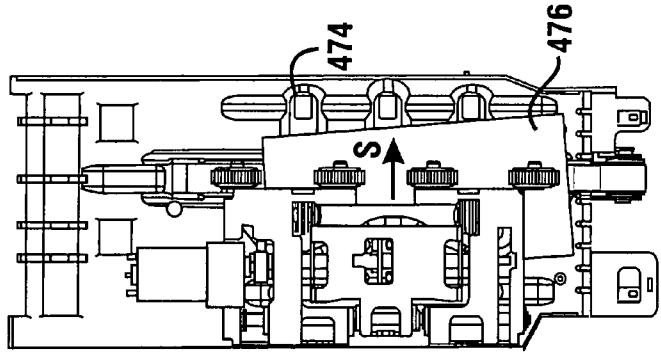


FIG. 13

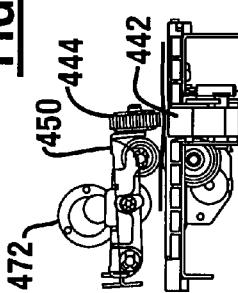


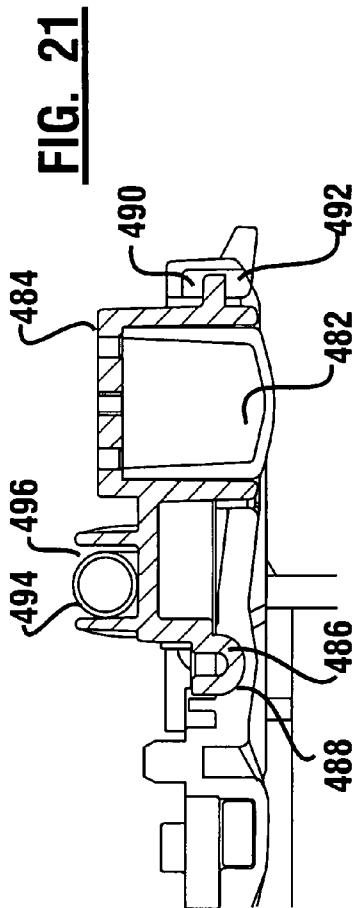
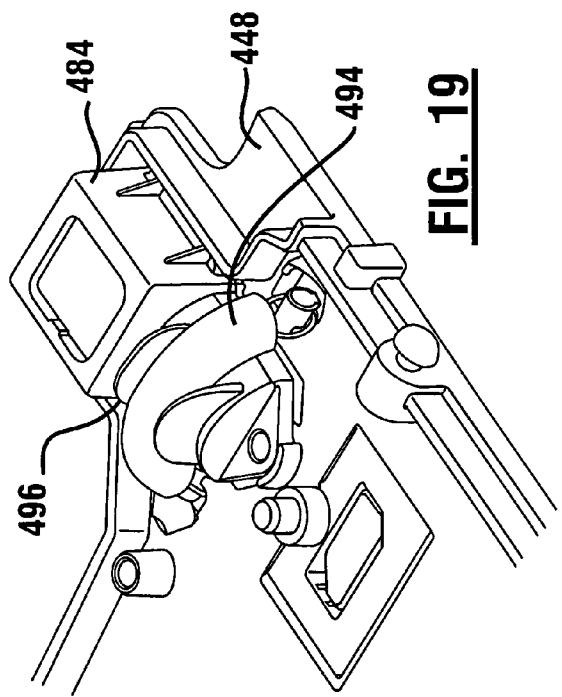
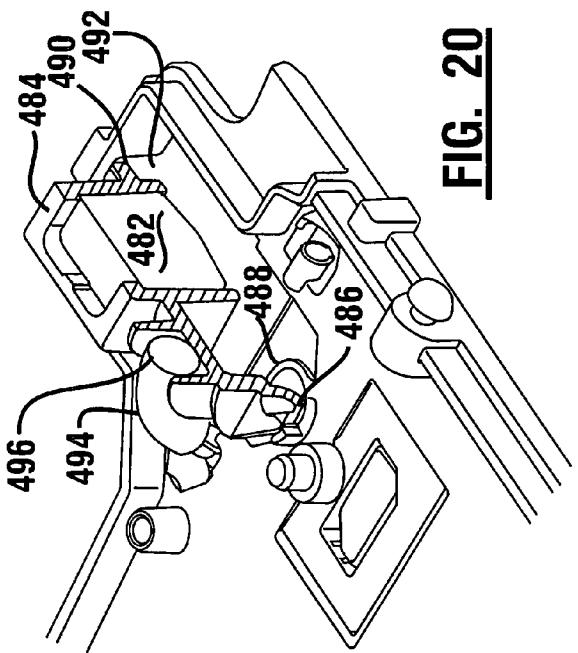
FIG. 14

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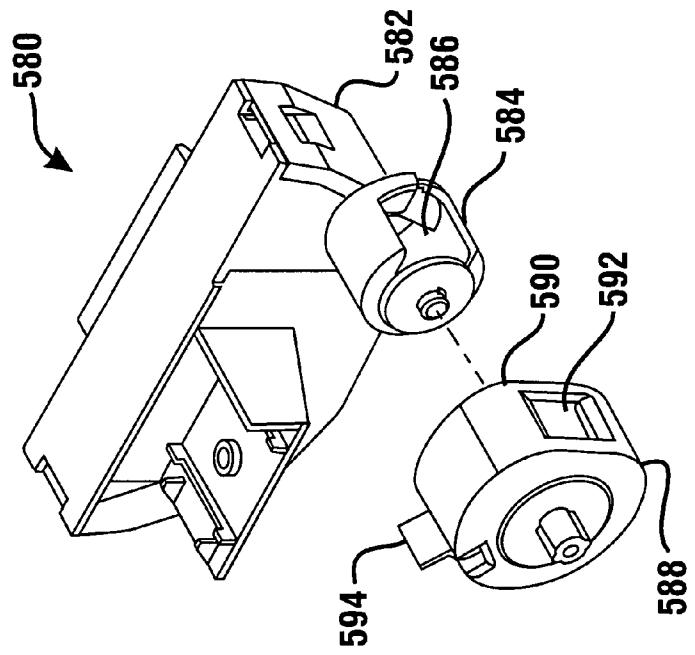


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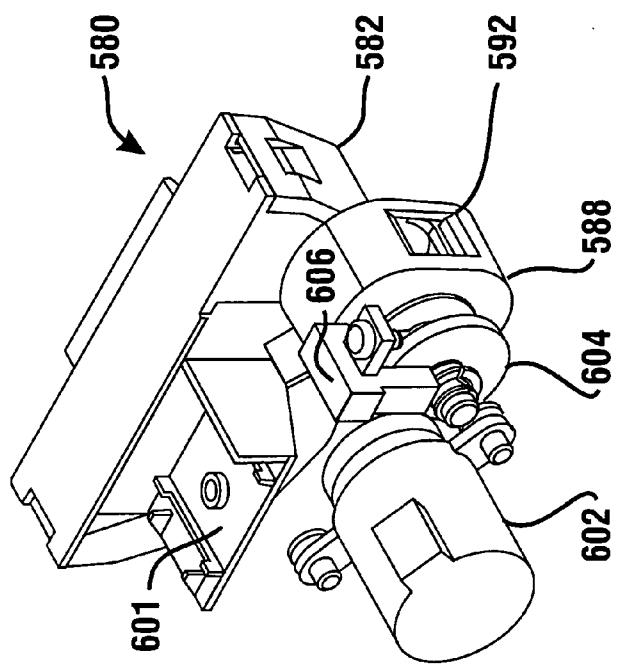
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**FIG. 23**



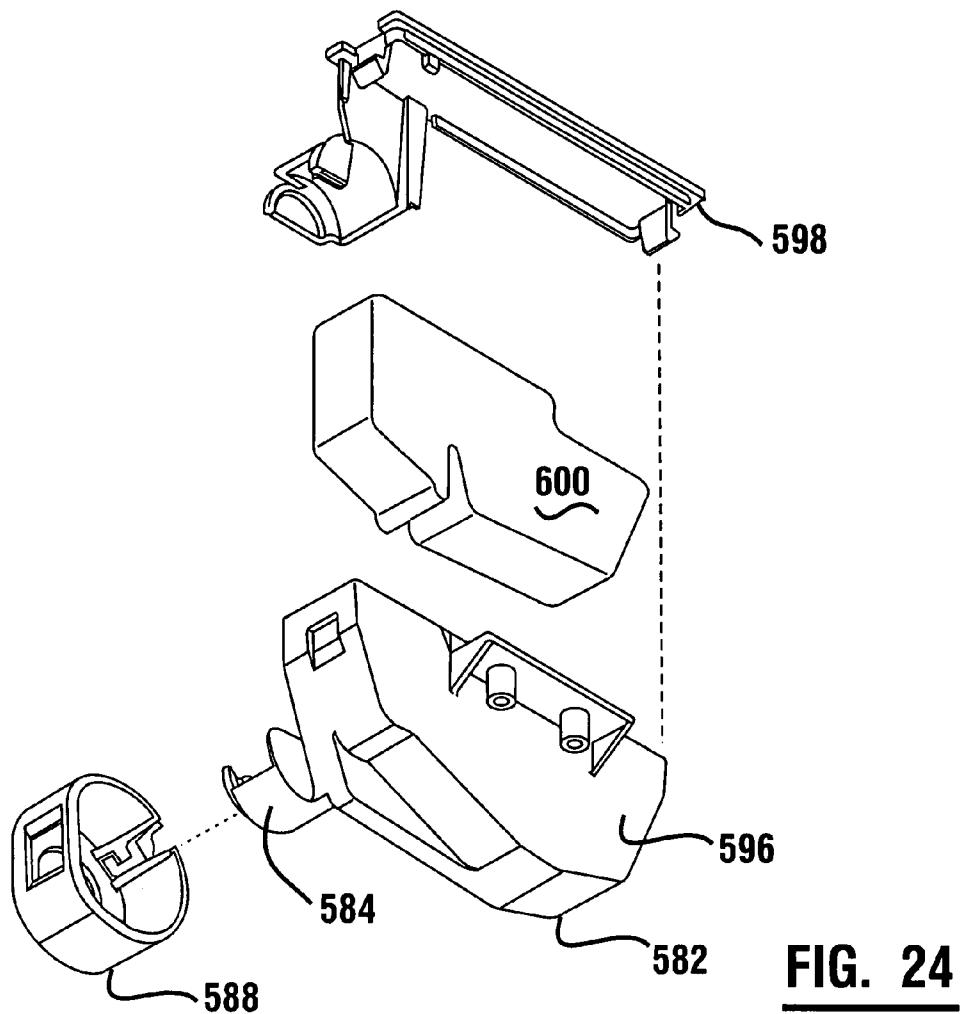
**FIG. 22**

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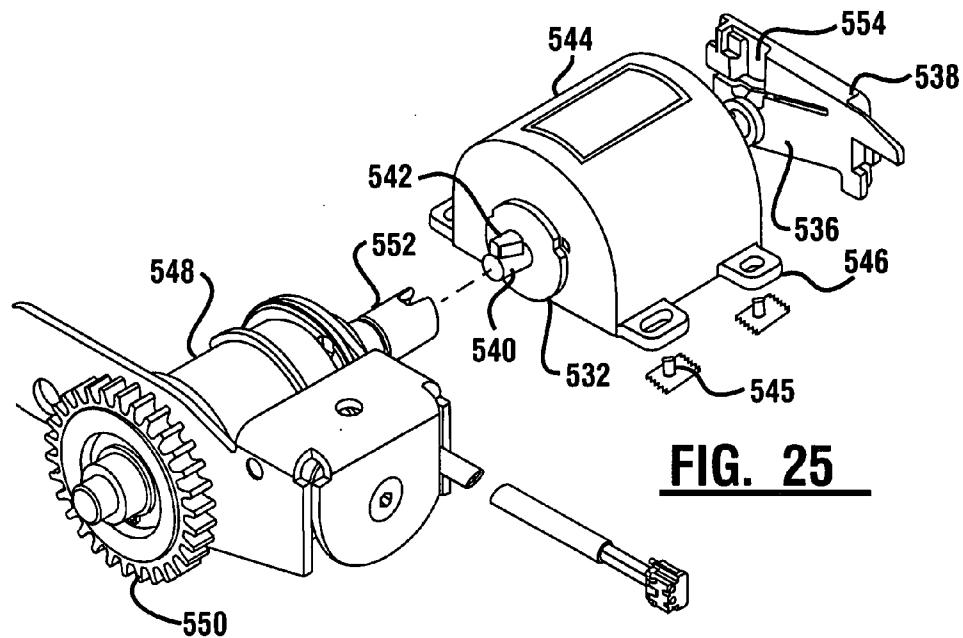
**FIG. 24**

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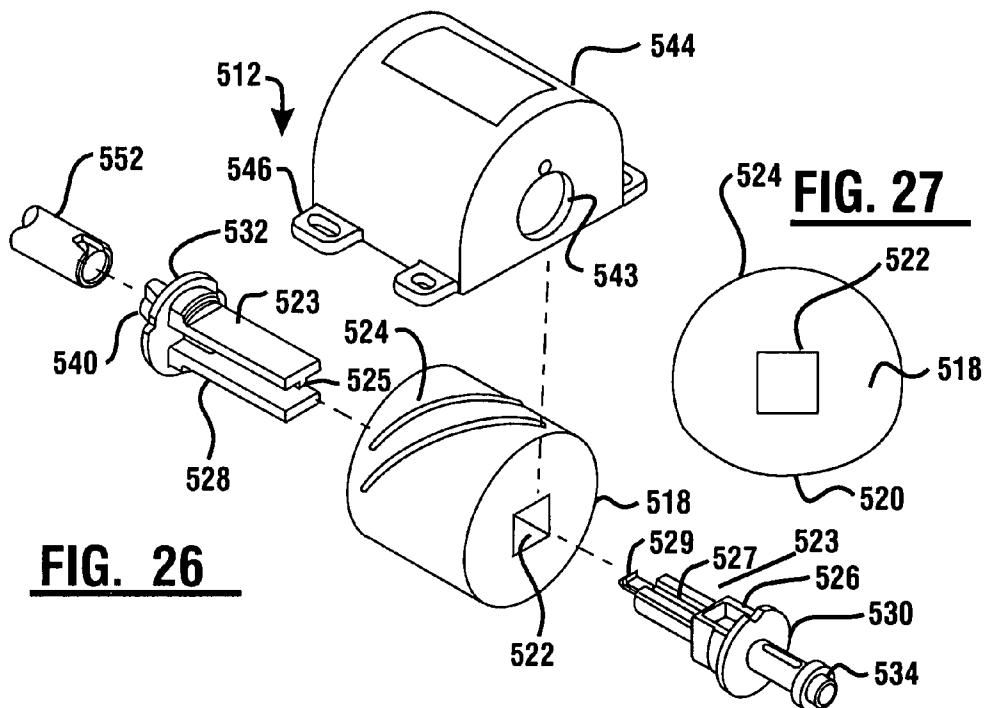
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**FIG. 25**



**FIG. 26**

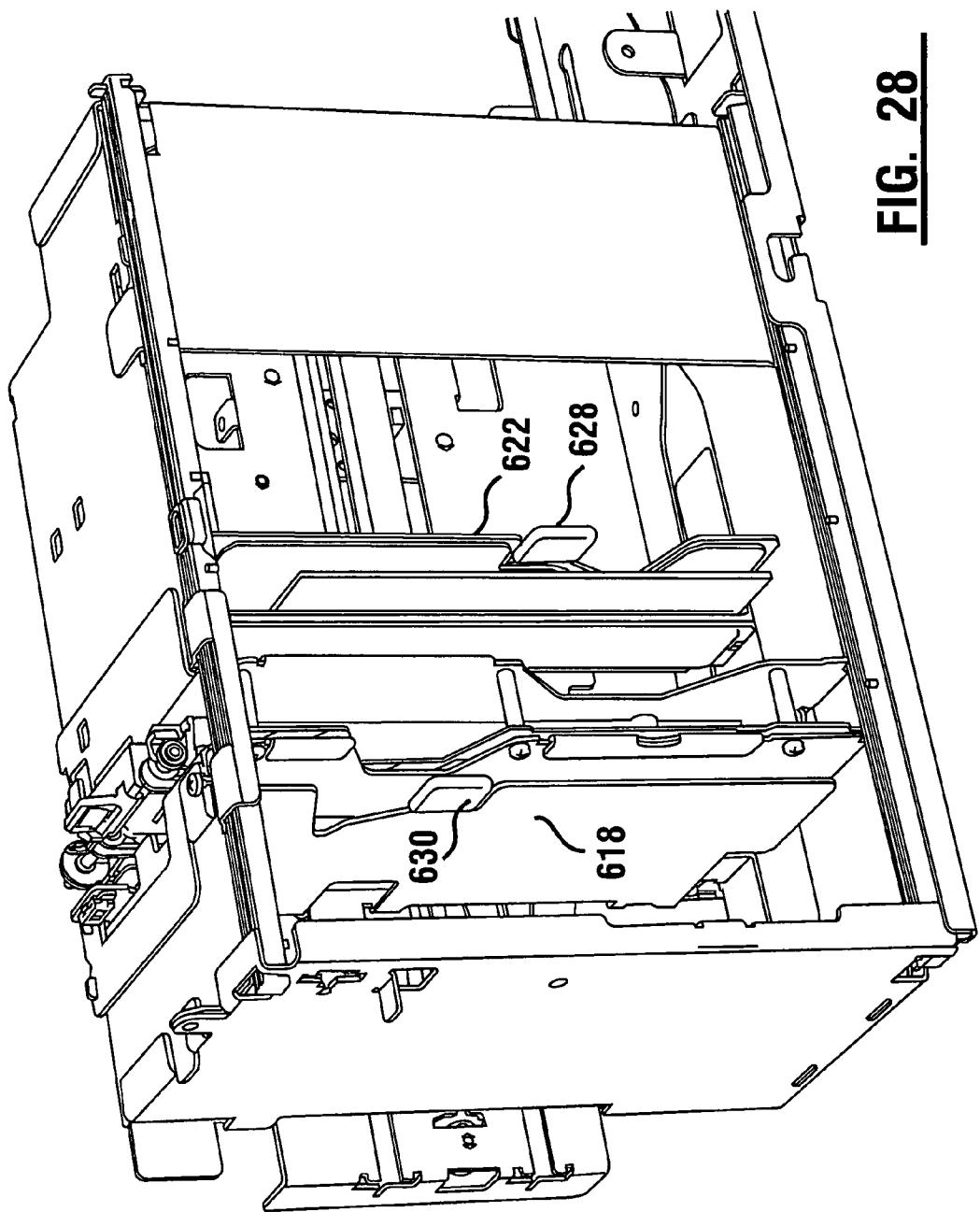
**FIG. 27**

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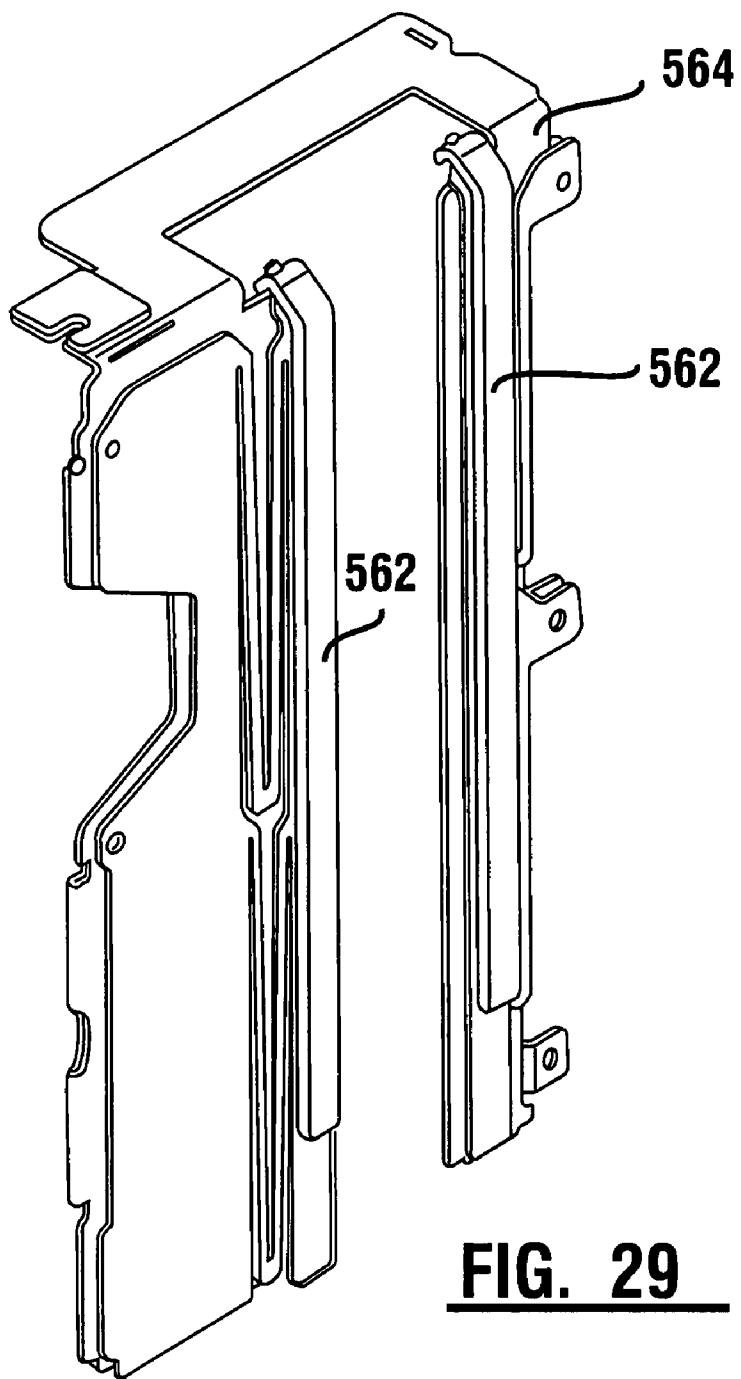
**FIG. 28**

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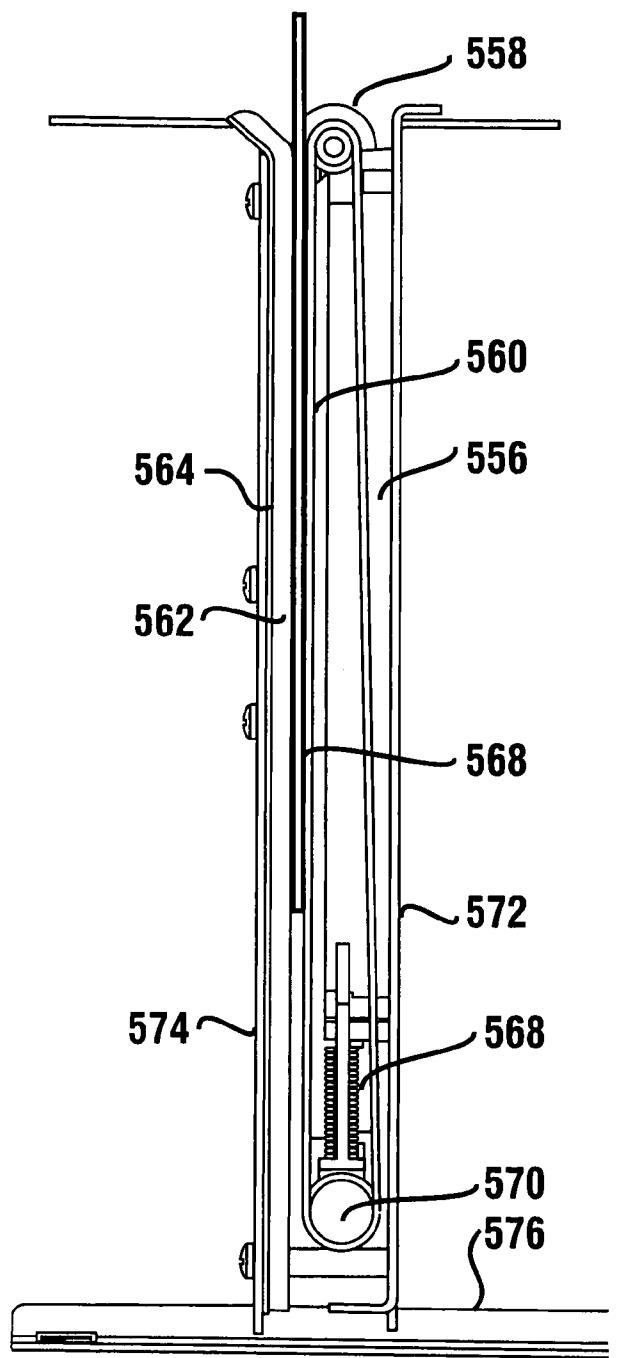
**FIG. 29**

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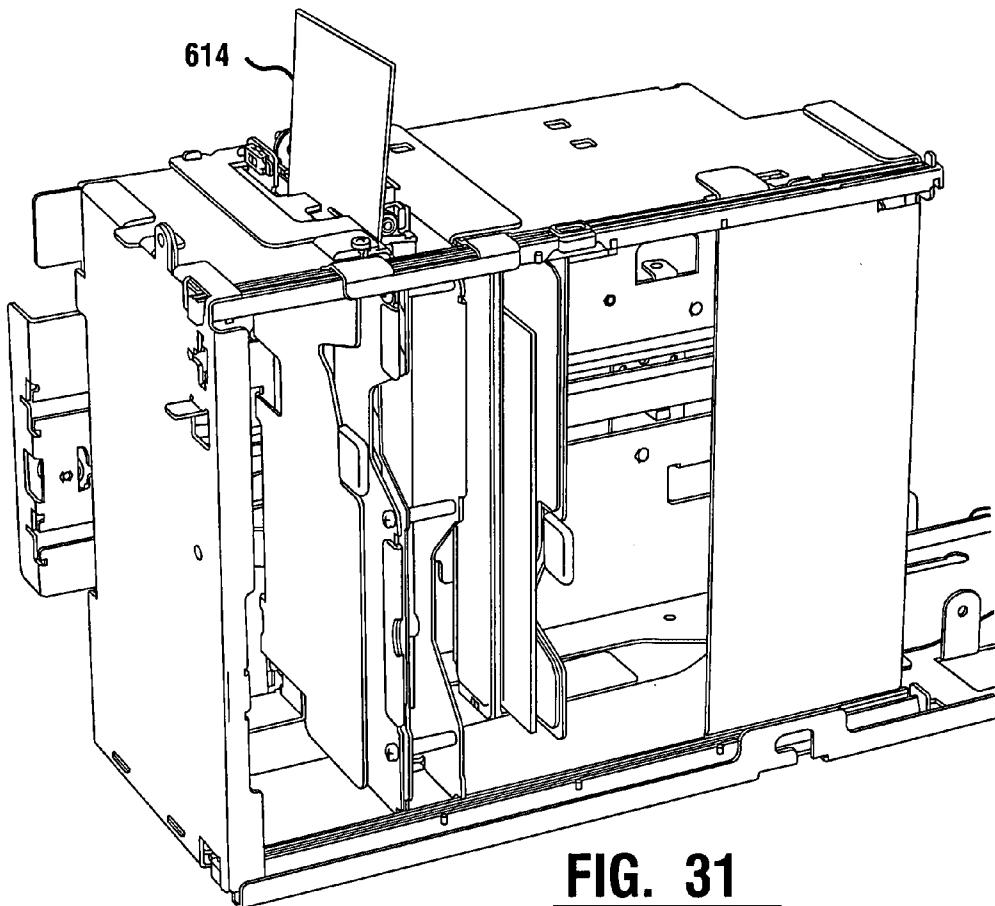
**FIG. 30**

**U.S. Patent**

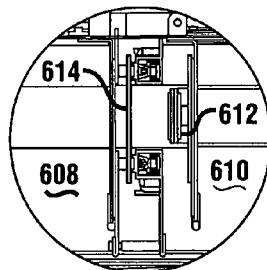
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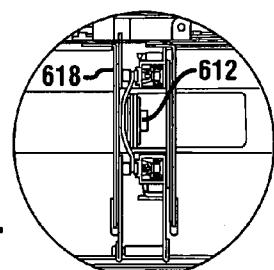
**US 7,832,631 B2**



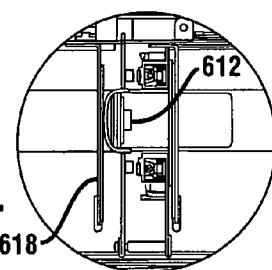
**FIG. 31**



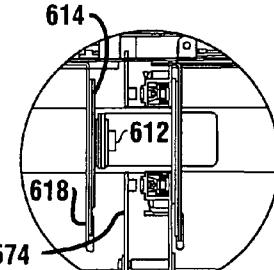
**FIG. 32**



**FIG. 33**



**FIG. 34**



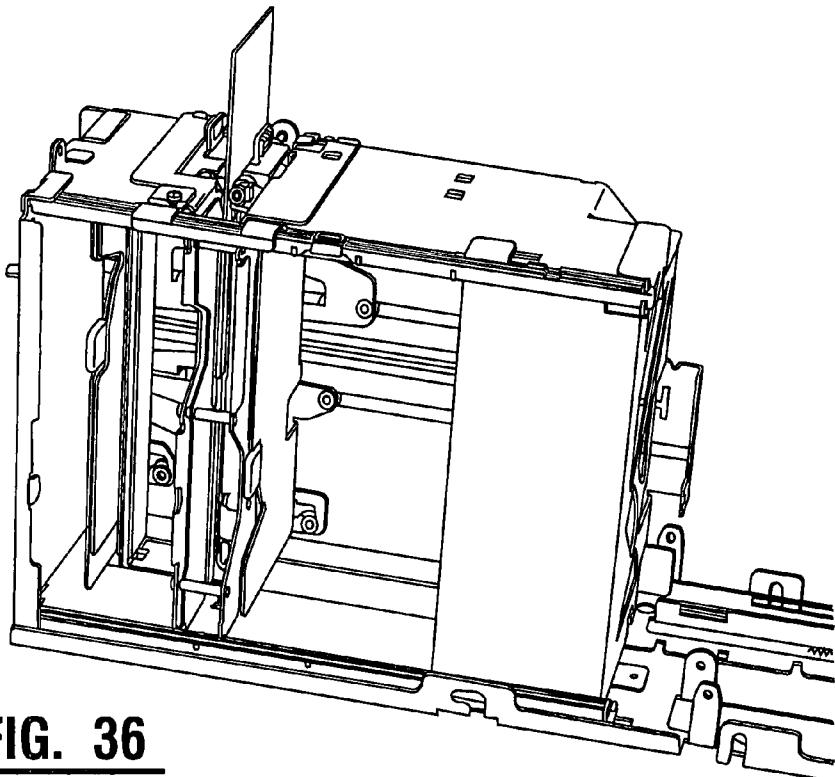
**FIG. 35**

**U.S. Patent**

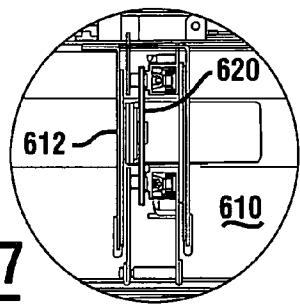
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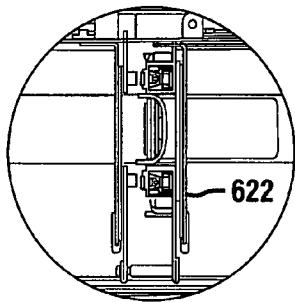
**US 7,832,631 B2**



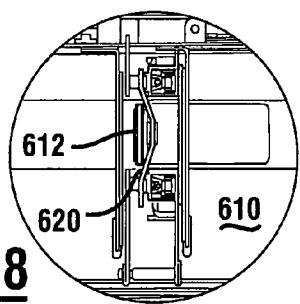
**FIG. 36**



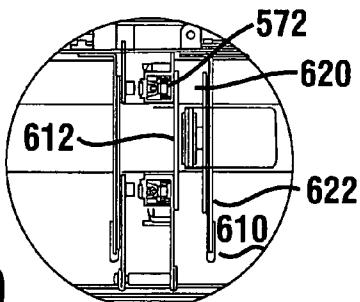
**FIG. 37**



**FIG. 39**



**FIG. 38**



**FIG. 40**

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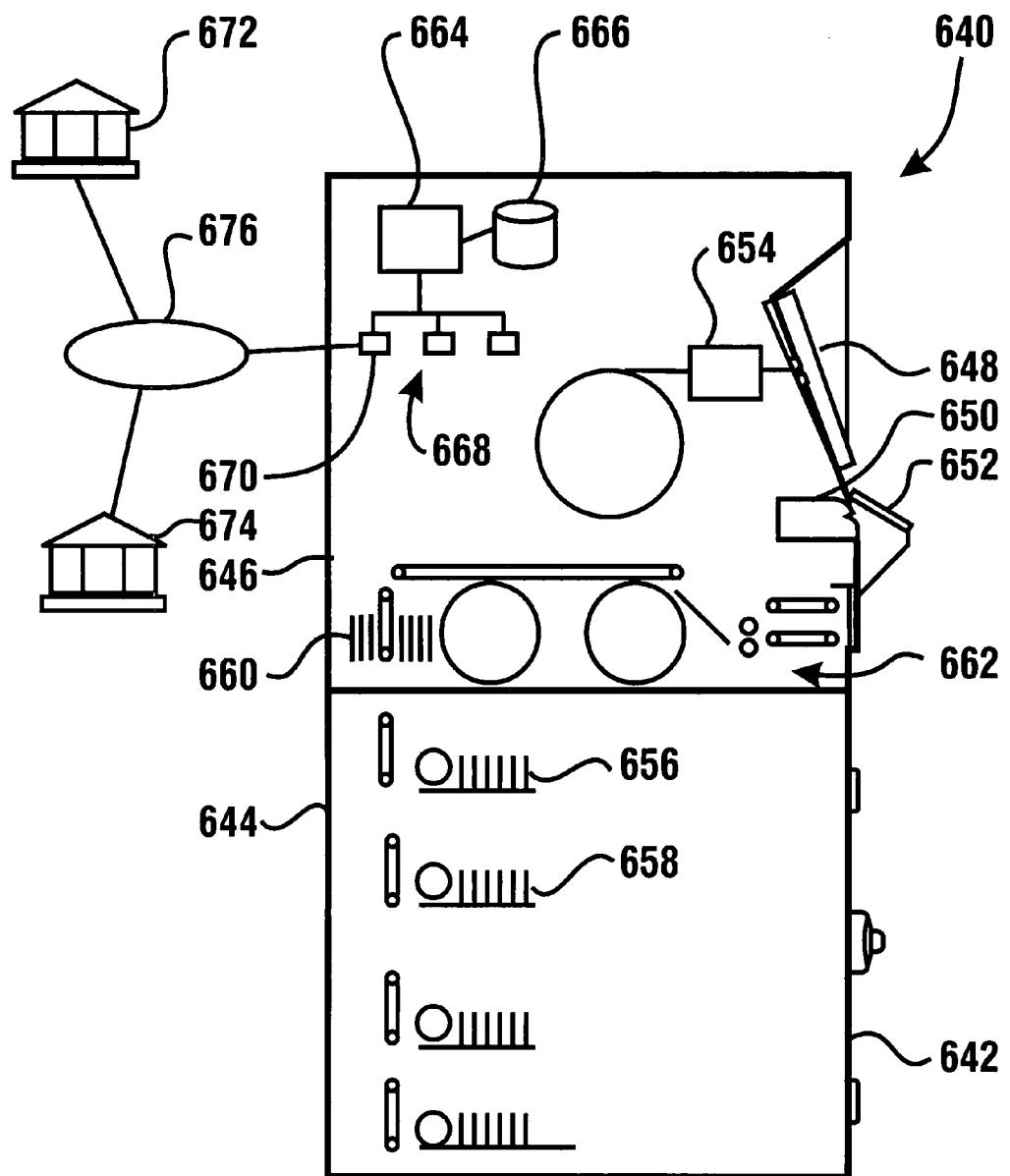


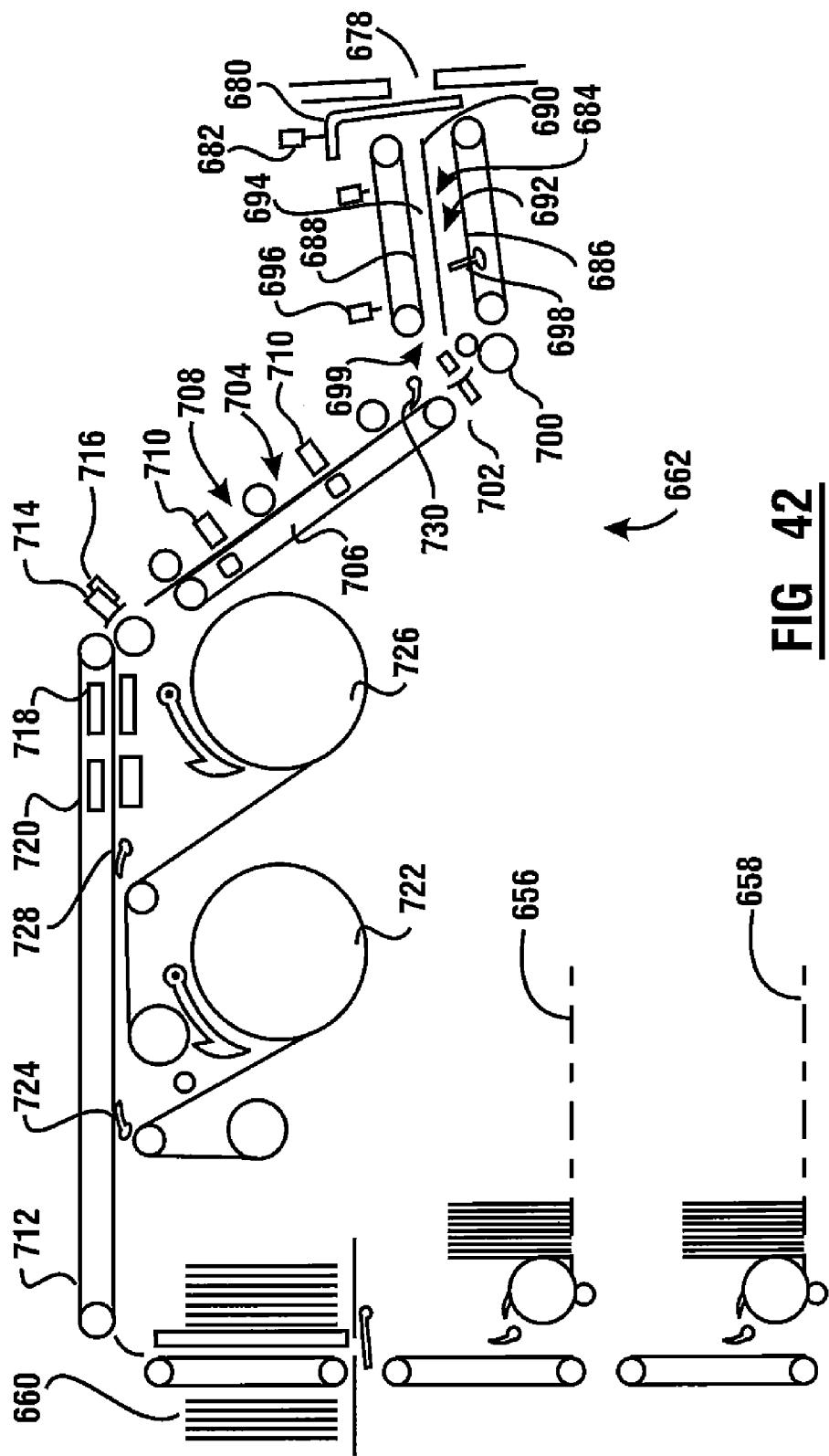
FIG 41

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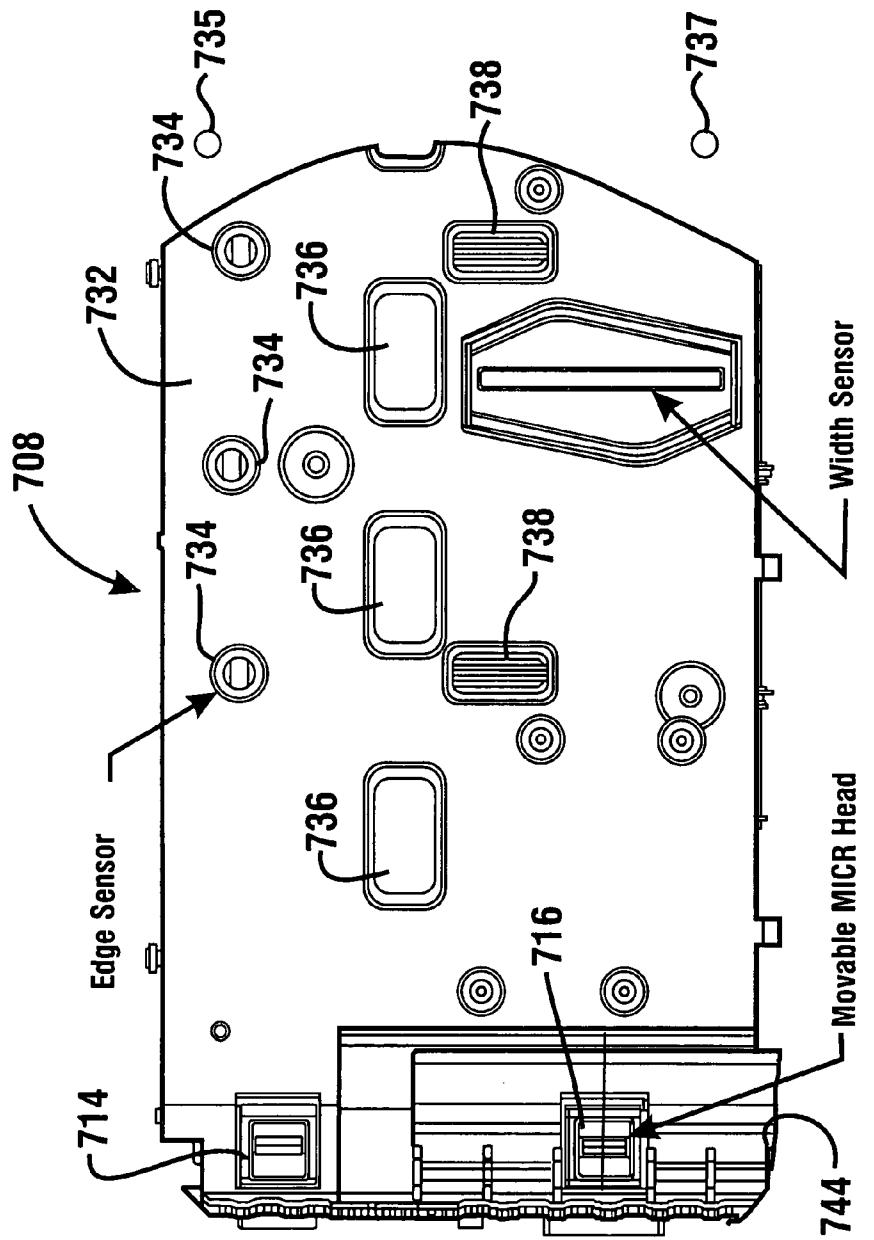


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**FIG 43**

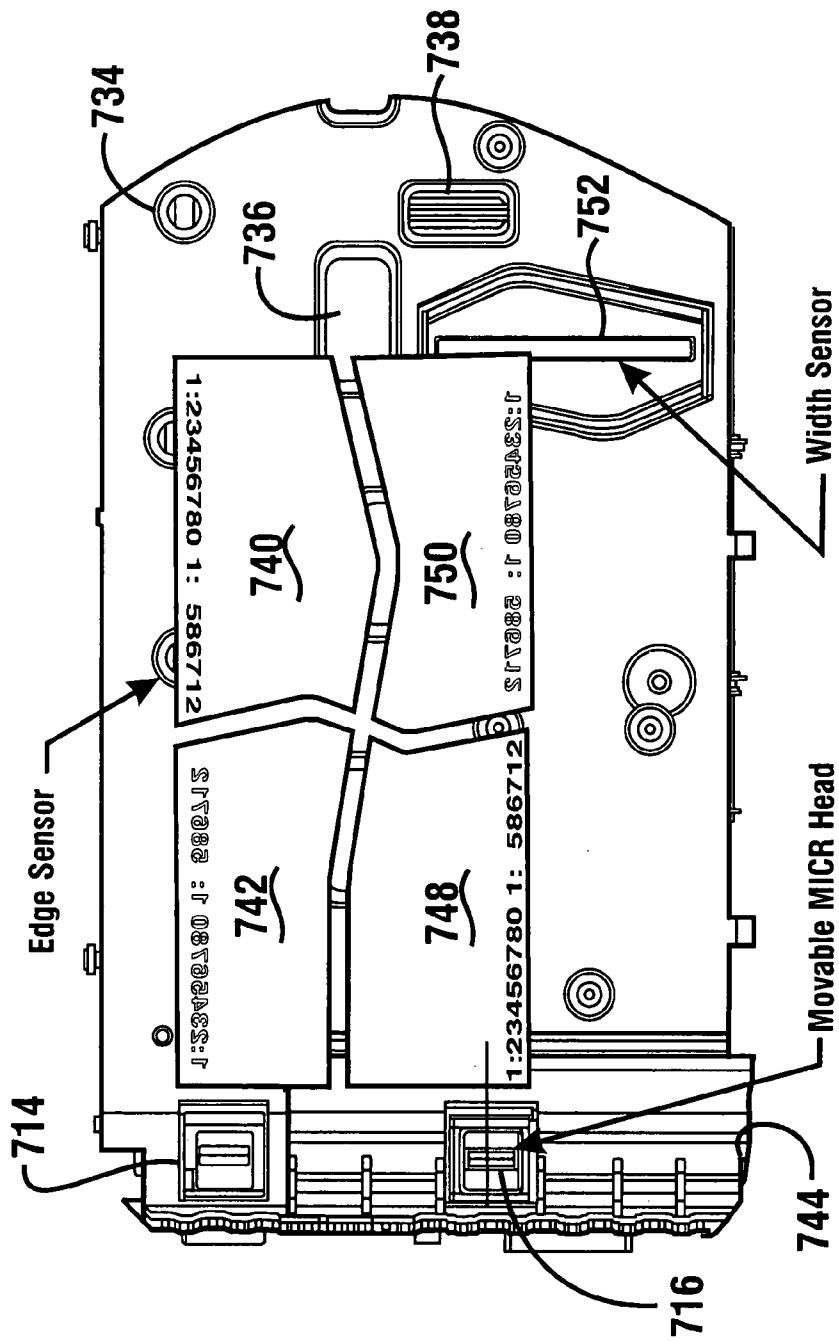
Check is aligned to edge sensors.  
Width sensor determines opposite edge of check  
Movable MICR head position based on width of check  
MICR can be read from either side of check

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**FIG 44**

Check is aligned to edge sensors.  
Width sensor determines opposite edge of check  
Movable MICR head position based on width of check  
MICR can be read from either side of check

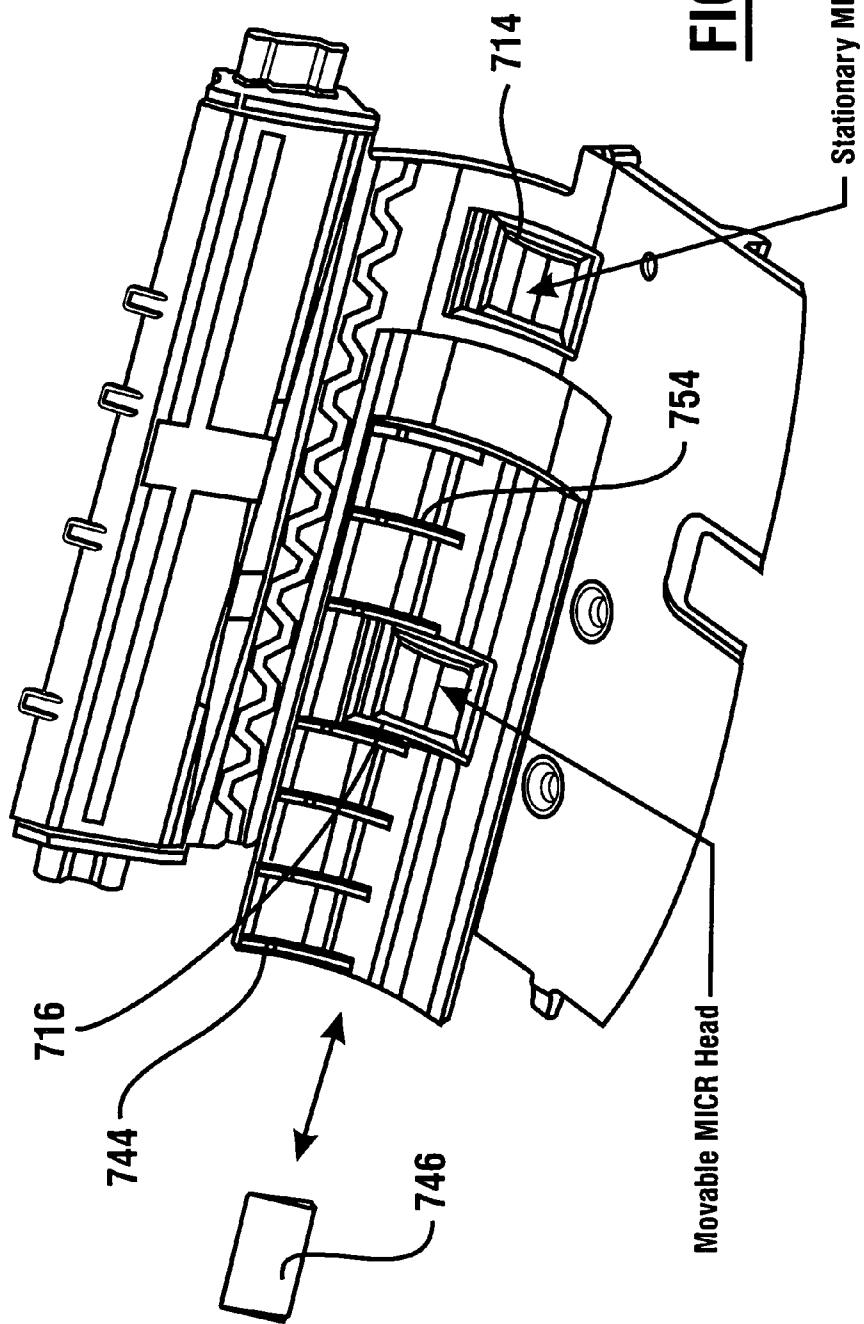
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**FIG 45**



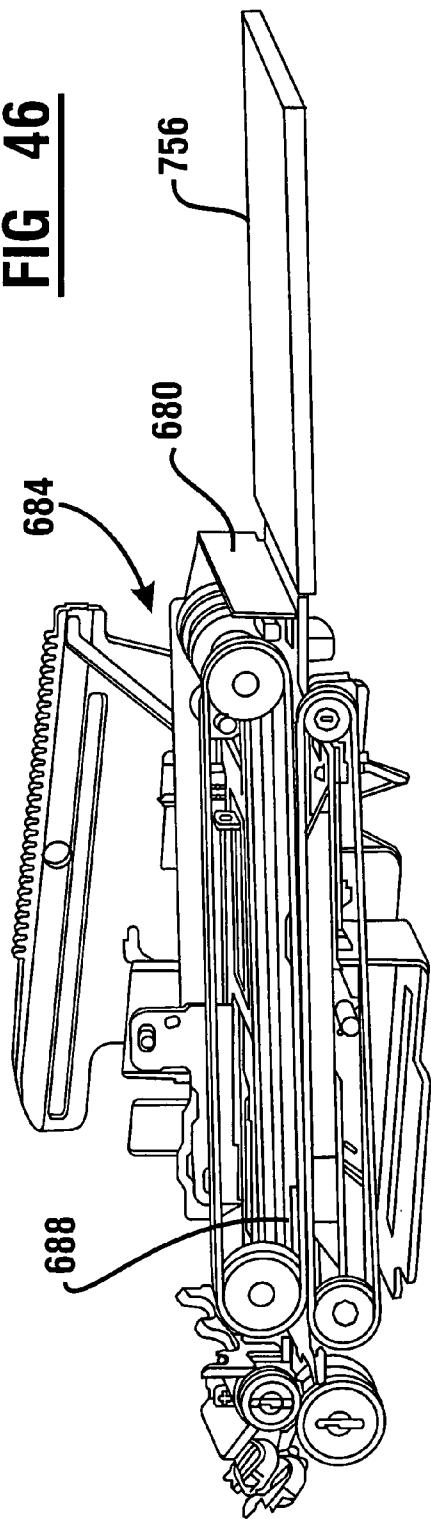
U.S. Patent

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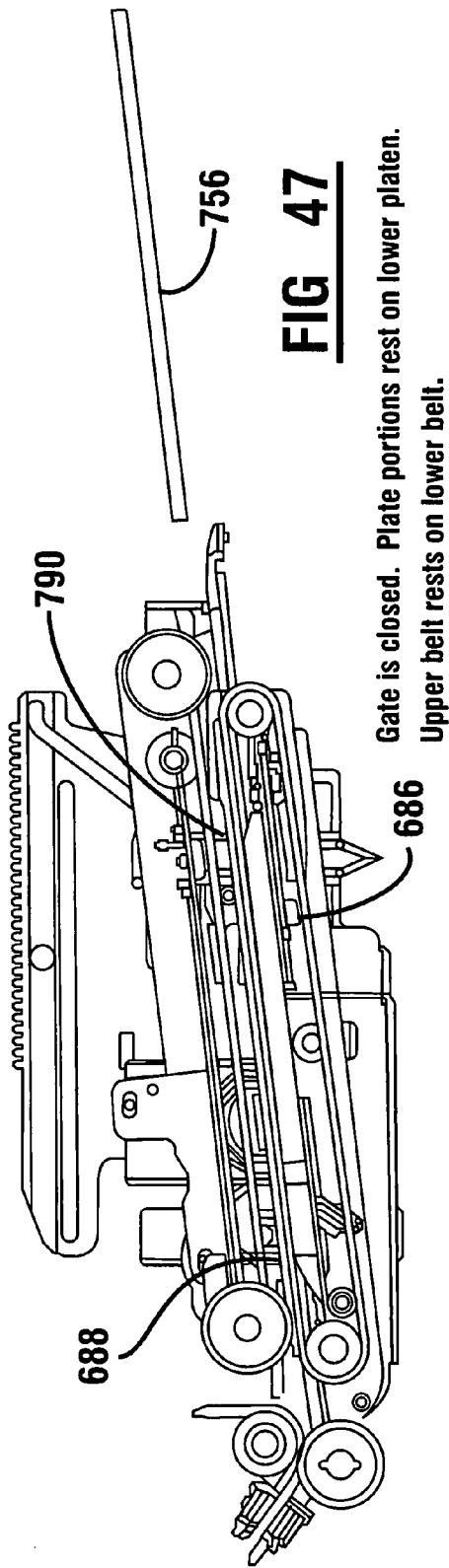
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**FIG 46**



**FIG 47**



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FIG 48

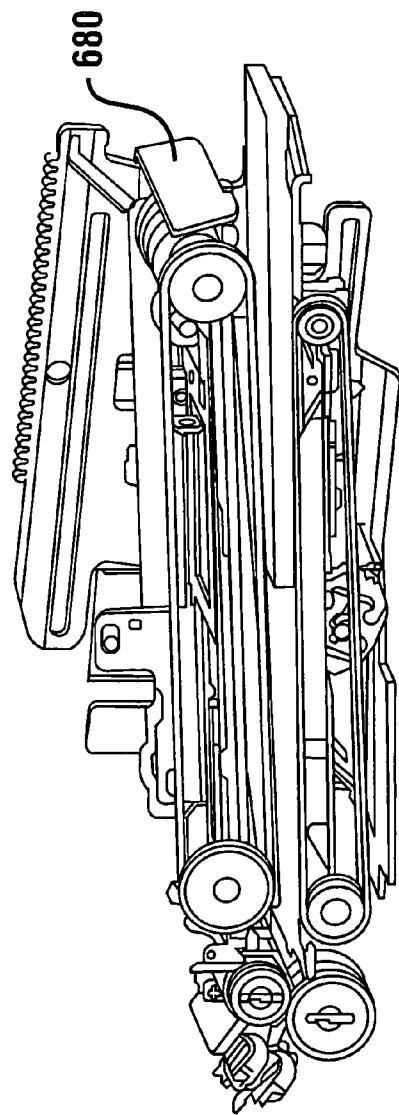
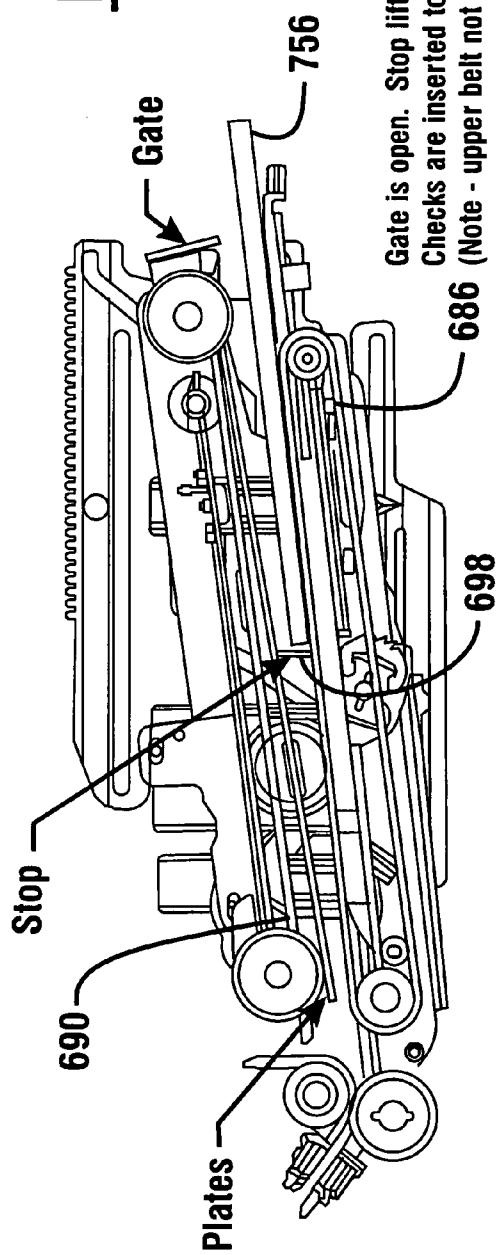


FIG 49

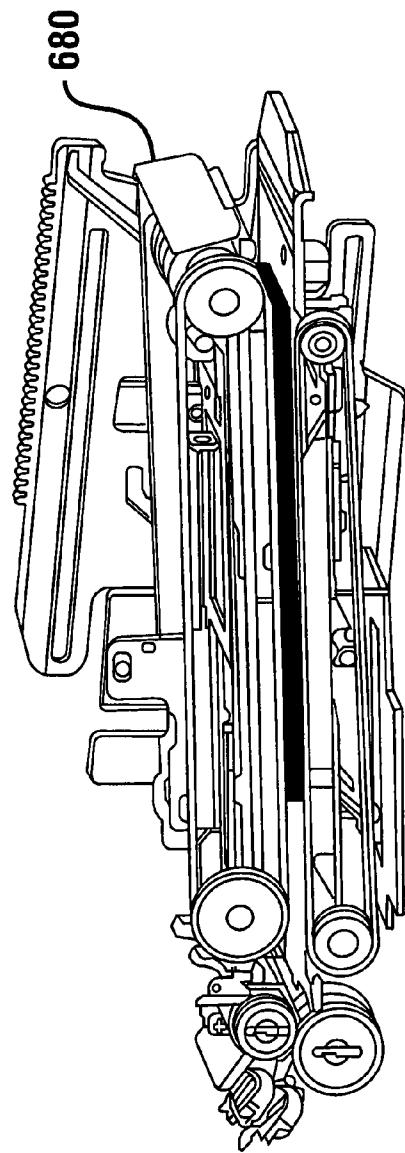


U.S. Patent

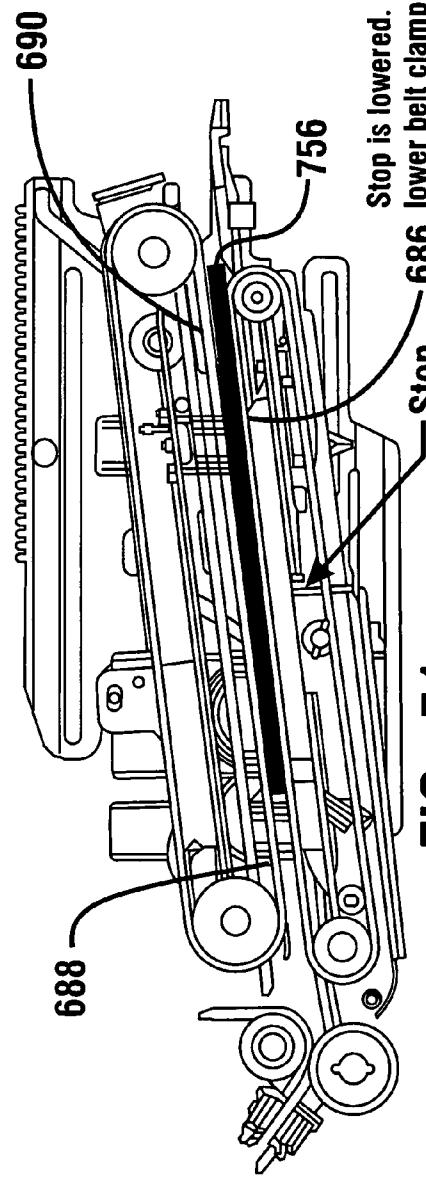
Nov. 16, 2010

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**FIG 50**



**FIG 51**

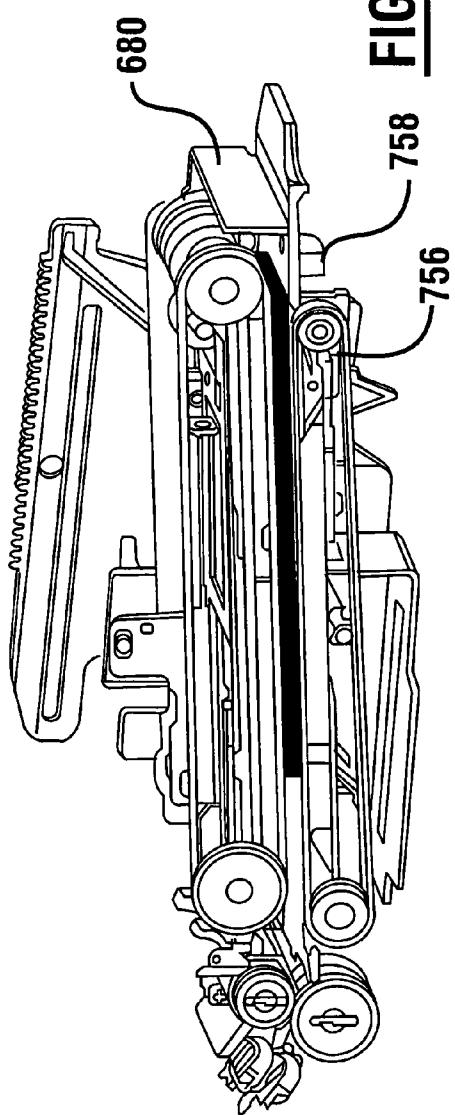
Stop is lowered. Upper belt and  
lower belt clamp and move the checks in.  
Plate portions are sitting on checks.

U.S. Patent

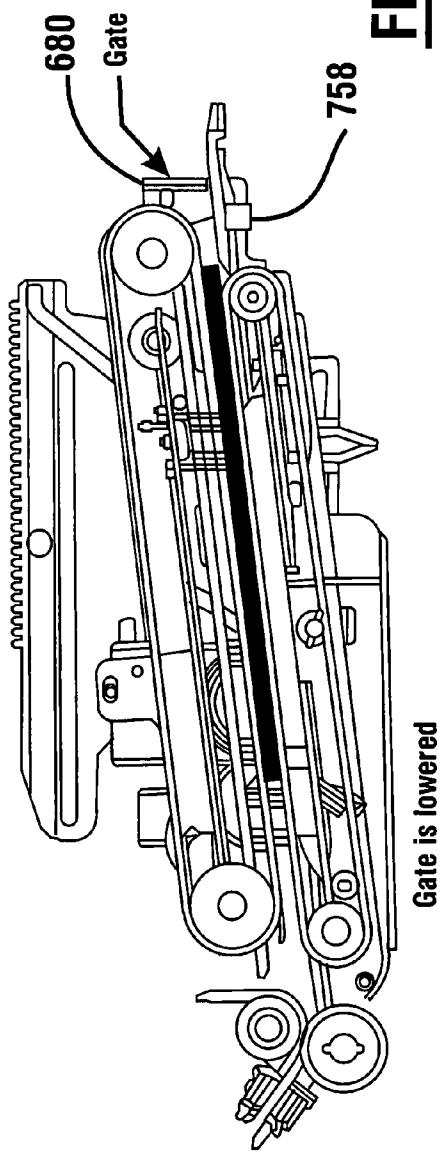
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**FIG 52**



**FIG 53**

Gate is lowered

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FIG 54

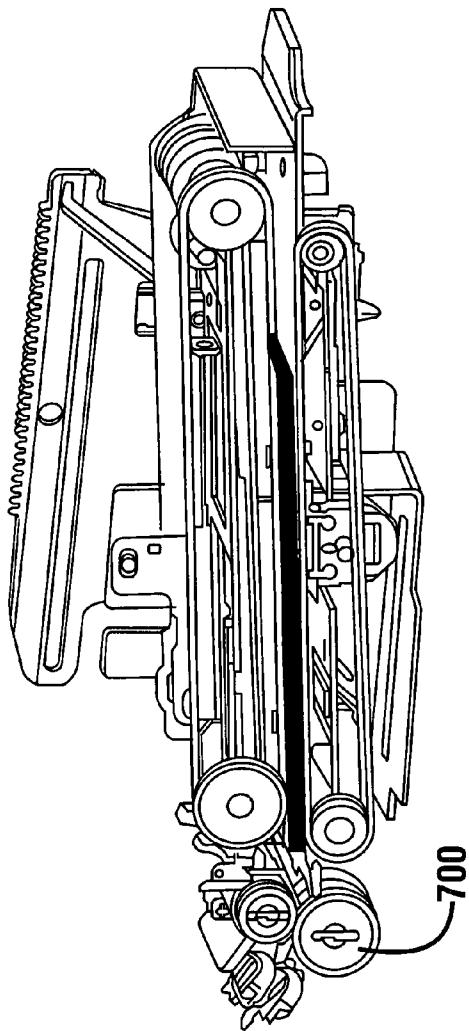
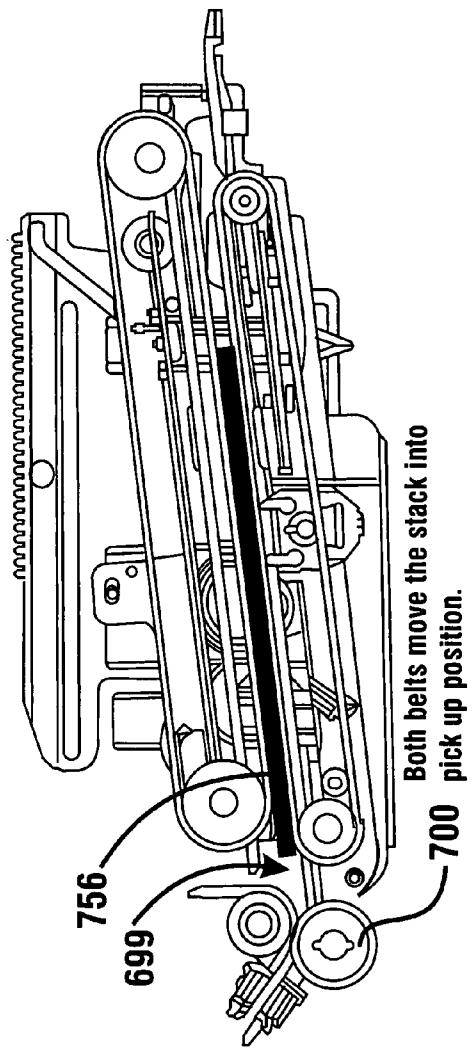


FIG 55



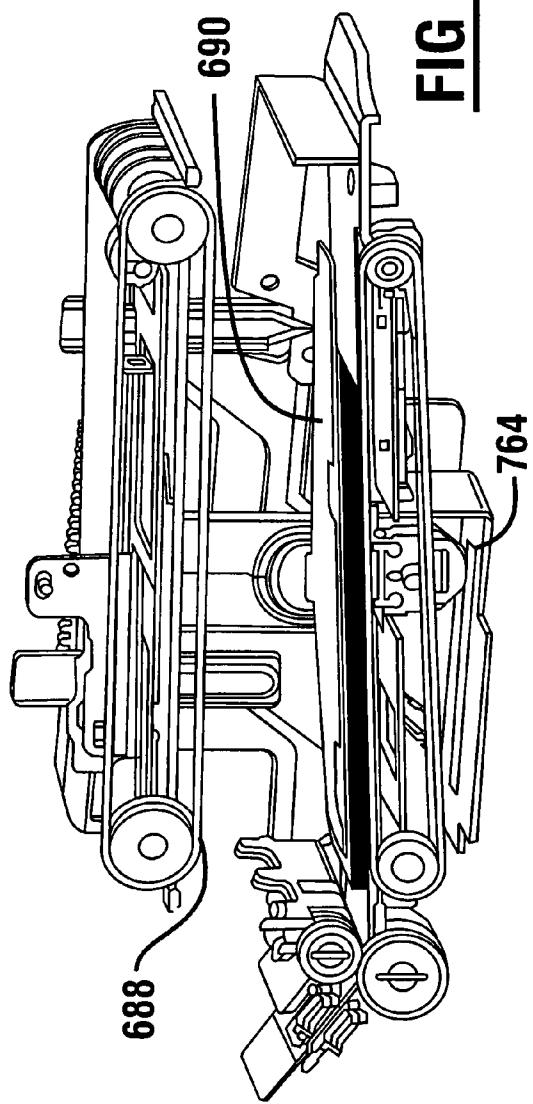
U.S. Patent

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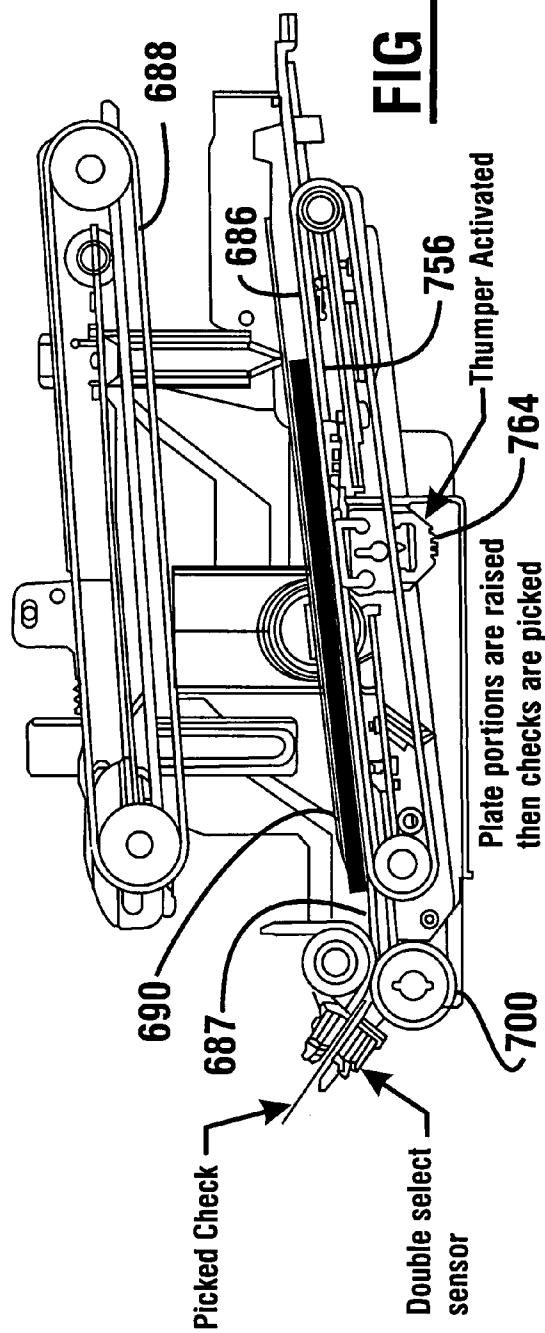
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**FIG 56**



**FIG 57**

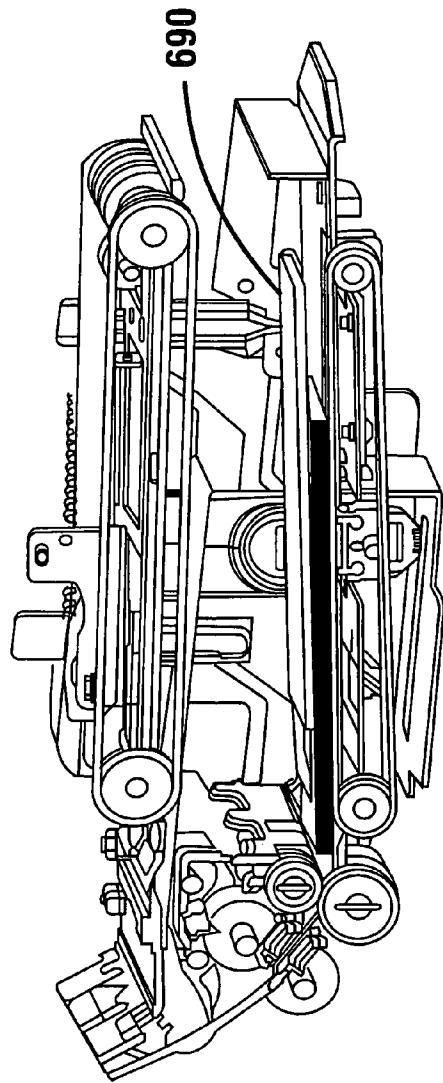
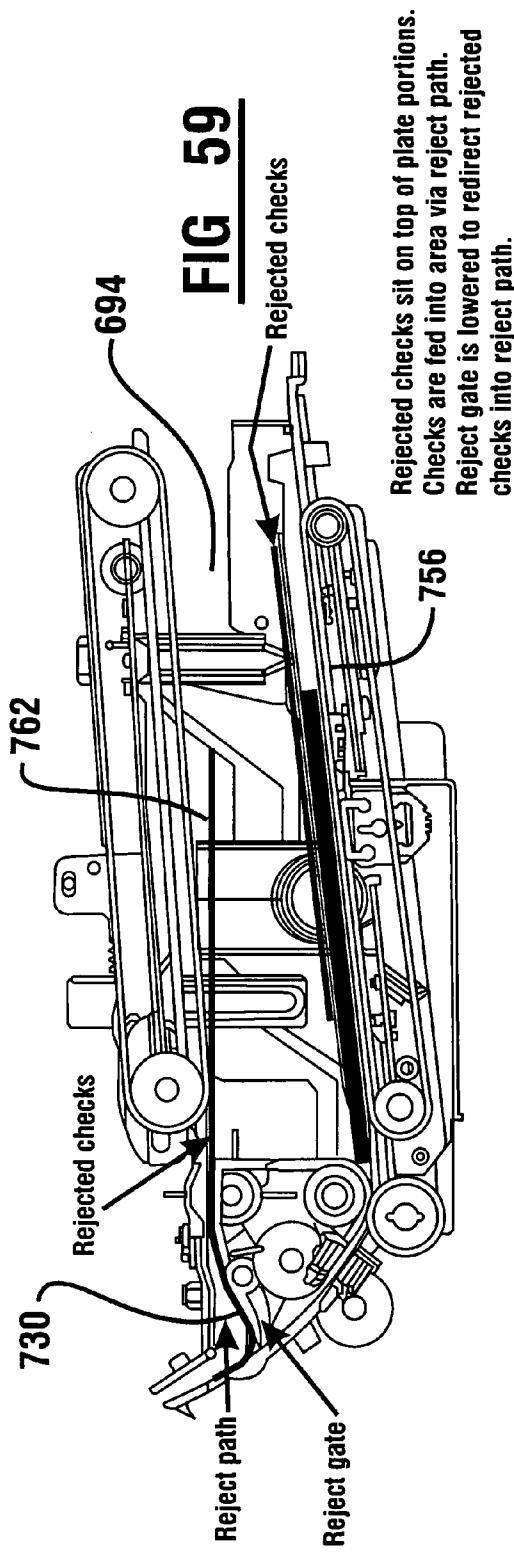


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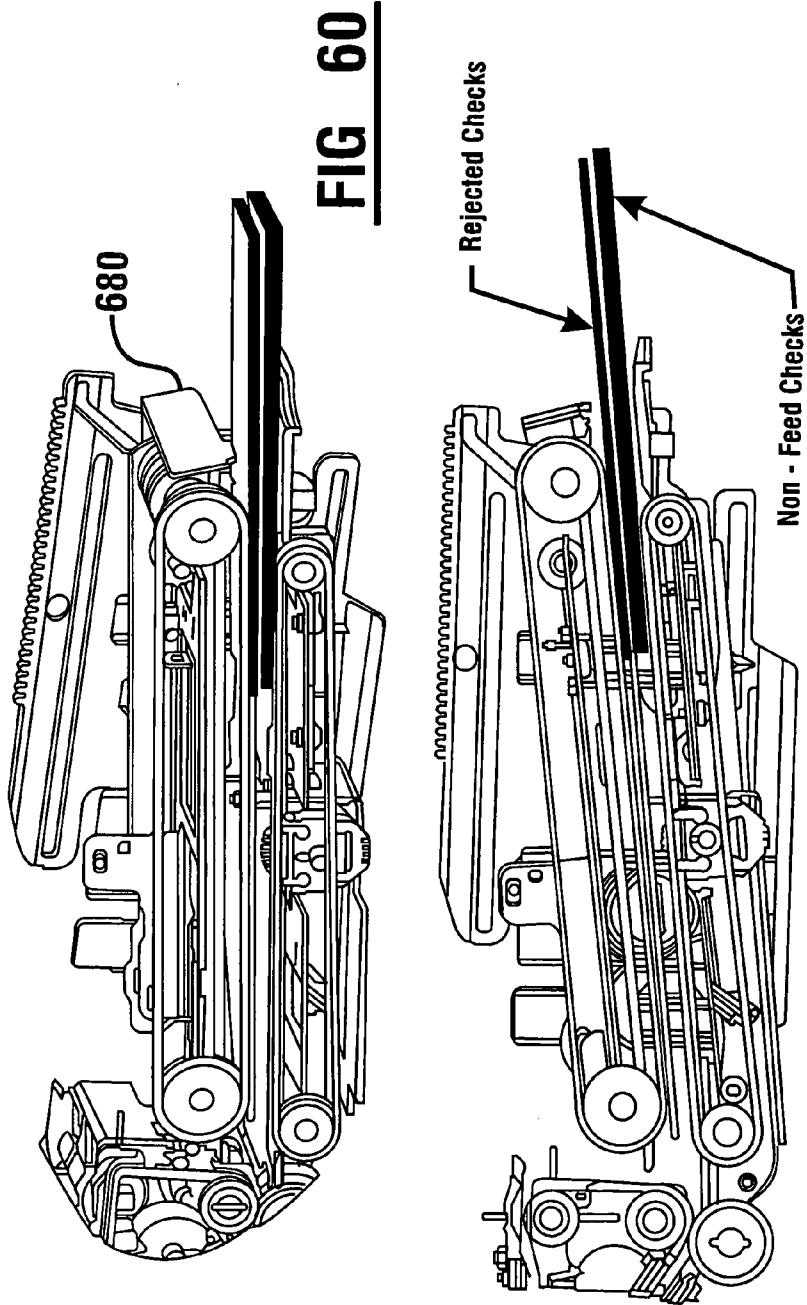
FIG 58FIG 59

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Rejected Checks sit on top of plate portions.

Non-feed Checks are below plate portions.

Checks are clamped between upper belt and lower belt.

Gate is opened and both belts are run to feed checks back to customer.

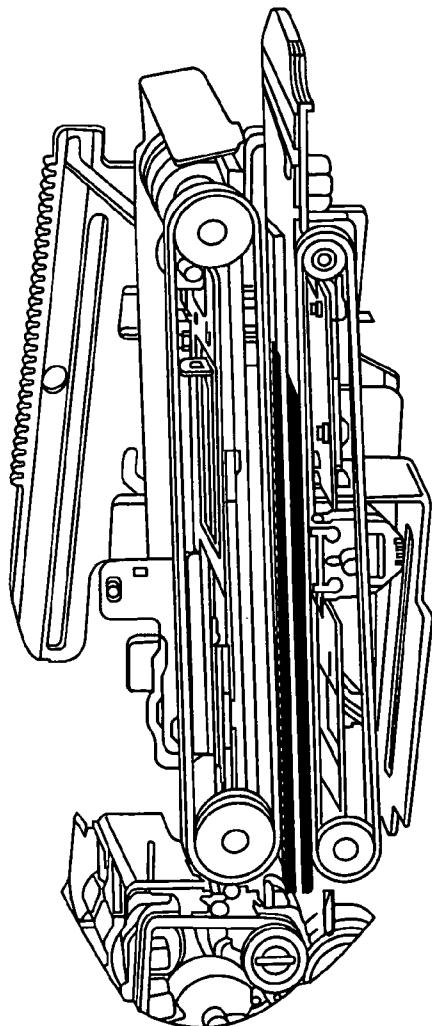
U.S. Patent

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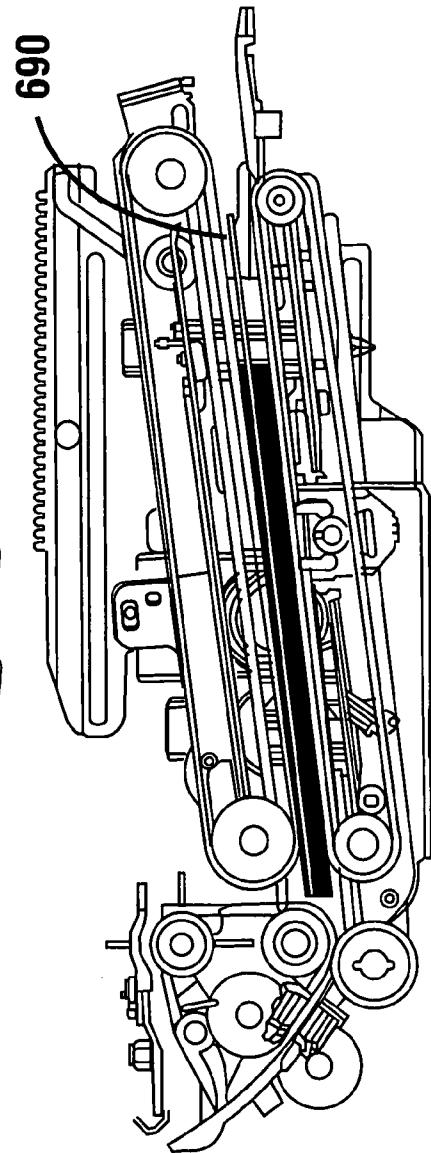
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**FIG 62**



**FIG 63**



If the customer doesn't take checks  
upper belt and lower belt pull checks  
back into the machine.

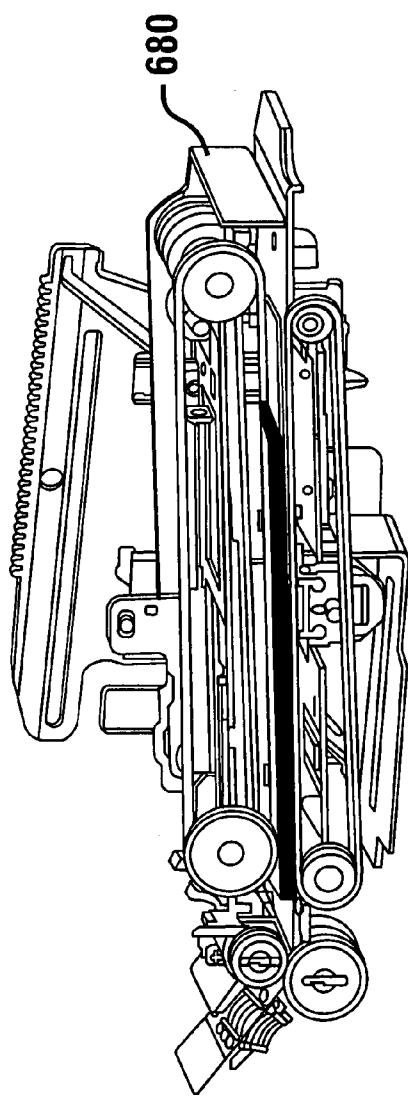
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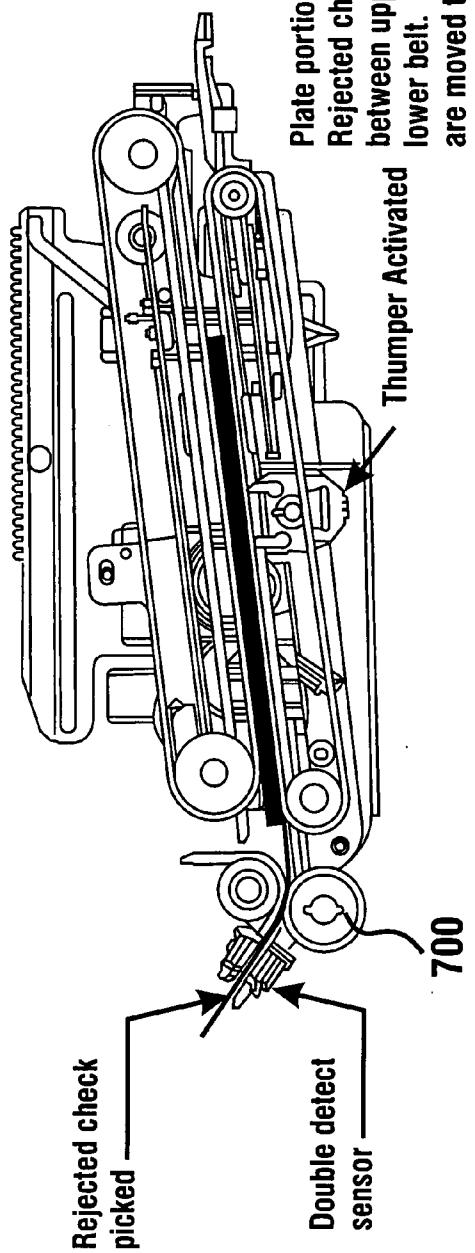
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**FIG 64**



**FIG 65**



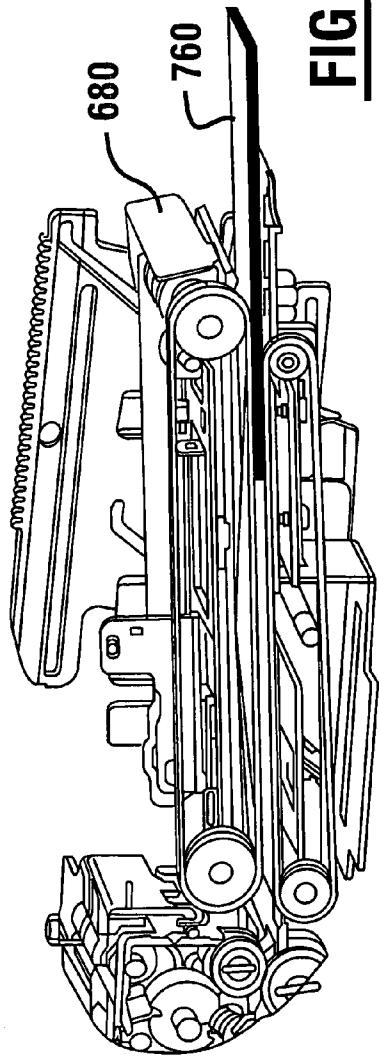
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**FIG 66**



**FIG 67**

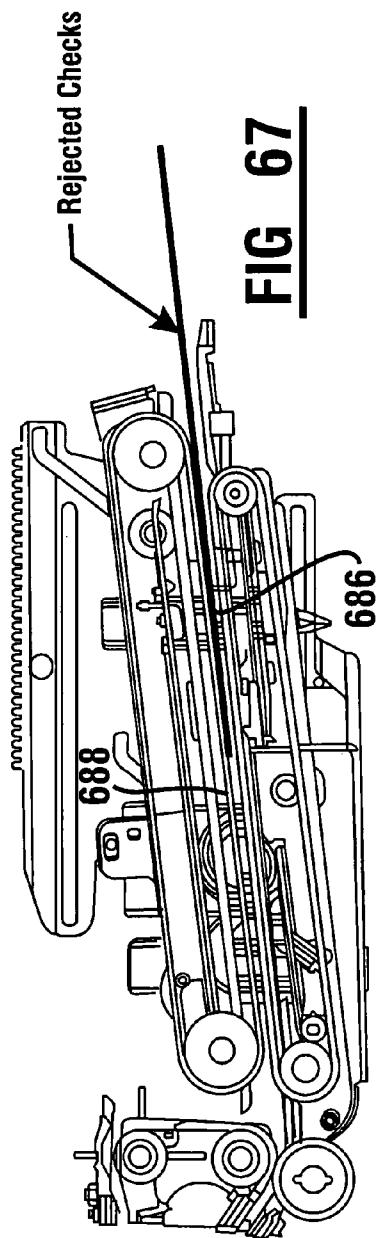


Plate portions sit on lower platen.

Rejected checks are above plate.

Rejected checks are clamped between upper belt and lower belt.

Gate is opened and both belts are run to feed rejected checks back to customer.

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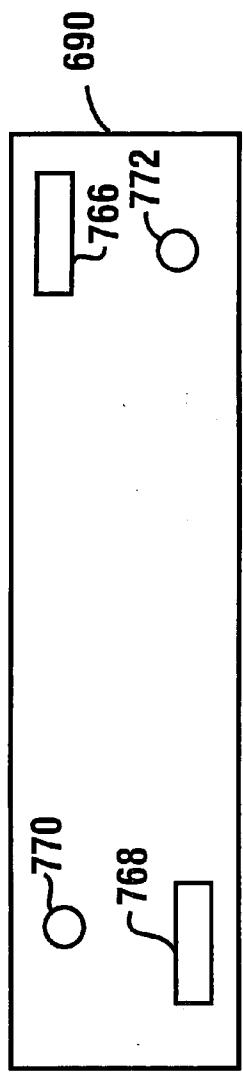


Fig. 69

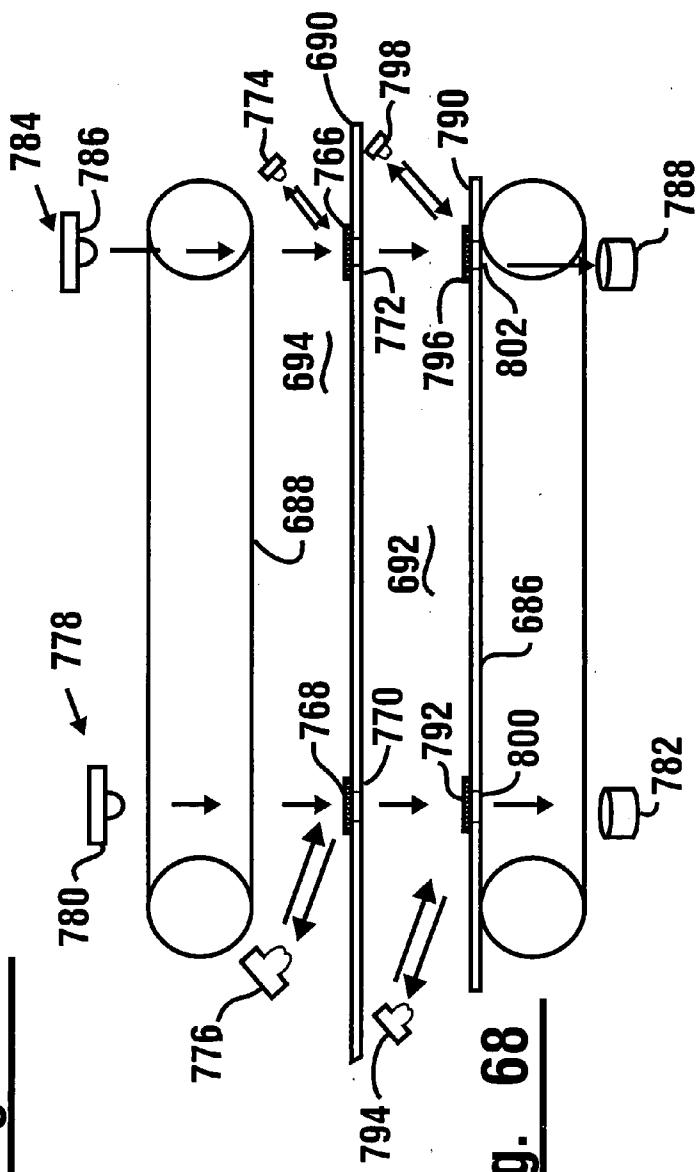


Fig. 68

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**METHOD OF READING CODED RECORDS  
INCLUDING MAGNETIC INDICIA ON  
CHECKS DEPOSITED IN AN AUTOMATED  
BANKING MACHINE**

**CROSS REFERENCE TO RELATED  
APPLICATIONS**

This application claims benefit pursuant to 35 U.S.C. §119 (e) of Provisional Application Ser. No. 60/858,024 filed Nov. 10, 2006, the disclosure of which is incorporated herein by reference.

**TECHNICAL FIELD**

This invention pertains to systems that are operative to read magnetic coded records which may be classified in U.S. Class 235, Subclass 449. In addition this invention pertains to coded record structures and the operation thereof which may be classified in U.S. Class 235, Subclass 439.

**BACKGROUND ART**

Automated banking machines are known in the prior art. Such automated banking machines operate responsive to data read from coded records. Automated banking machines are commonly used to carry out transactions such as dispensing cash, checking account balances, paying bills and/or receiving deposits from users. Other types of automated banking machines may be used to purchase tickets, to issue coupons, to present checks, to print scrip and/or to carry out other functions either for a consumer or a service provider. For purposes of this description any device which is used for carrying out transactions involving transfers of value shall be referred to as an automated banking machine.

Automated banking machines may benefit from improvements.

**OBJECTS OF EXEMPLARY EMBODIMENTS**

It is an object of an exemplary embodiment to provide a system controlled by data bearing records.

It is a further object of an exemplary embodiment to provide a coded record sensing device and method.

It is a further object of an exemplary embodiment to provide an automated banking machine.

It is a further object of an exemplary embodiment to provide a record controlled calculating apparatus.

It is a further object of an exemplary embodiment to provide a deposit accepting apparatus which can be used to accept, image and verify the authenticity of items.

Further objects of exemplary embodiments will be made apparent in the following Best Modes for Carrying Out Invention and the appended claims.

In an exemplary embodiment an automated banking machine includes a card reader. The card reader is operative to read data included on user cards. The data read from user cards is used to identify authorized users who may perform transactions at the machine. The exemplary embodiment operates to accept documents. These documents may include checks, currency bills and/or other types of documents. A single deposit accepting device may accept multiple types of documents. In this embodiment a document such as a check is received through an opening in the housing of the banking machine and moved in a transport path therein in a first direction by a first transport. Sensors are operative to sense the document has moved into a suitable location within the

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device. The document is then disengaged from the first transport and engaged with a pair of second transports which are disposed from one another in the first direction. The second transports engage the document and are operative to move the document in the transport path a direction transverse of the first direction. The first transport disengages from the document such that the second transports can move the document and align an edge thereof extending along the first direction with a plurality of non-contact sensors. At least one processor operates in accordance with its programming to control the second transports and controls movement of the document in the second direction such that an edge of the document is aligned with the non-contact sensors which serve as a “virtual wall” for purposes of positioning the document.

Once the document is aligned such that an edge extends along the first direction in the desired orientation, the first transport reengages the document while the second transports disengage. The document is then moved again in the first direction past one or more appropriate sensing devices. In the exemplary embodiment because the document is aligned along the first direction, documents which are checks may have magnetic indicia such as the micr line or other portion thereof, read through operation of one or more magnetic sensors such as a magnetic read head. Alternatively or in addition when the document is moved in a first direction, the magnetic properties of the document may be read or otherwise sensed in a plurality of locations by one or more magnetic sensors which are operative to read magnetic properties of the document, including indicia thereon such as the micr line and/or other features.

In this exemplary embodiment the check is moved in a first direction past a pair of scanning sensors. The scanning sensors are operative to read optical indicia on each side of the check and to produce image data corresponding thereto. The data corresponding to the optical indicia may be processed such that data corresponding to images of the front and rear of the check or portions thereof are generated and stored through operation of the processor in one or more data stores of the banking machine. The indicia on the check may also be analyzed for purposes of determining information regarding on the check so that it can be used in conducting a transaction.

In this embodiment once a check has been moved past the sensors which capture data corresponding to optical indicia, the check is moved in generally the first direction into an area which may serve as an escrow area for checks. In some embodiments the escrow area may be of sufficient length so that multiple checks or other documents may be temporarily stored therein. In the exemplary embodiment, the machine operates to determine whether the check is to be accepted or returned to the customer while the check is held in the escrow area. For example in some embodiments one or more processors in the banking machine may operate to determine if the check can be sufficiently accurately read, redeemed for cash or otherwise processed while the check is stored in the escrow area. If it is determined that the check cannot be accepted, one or more transports are operative to move the check out of the banking machine so that the check is returned to the customer.

Alternatively if the check is found to be suitable for acceptance, the check is moved from the escrow area past one or more stamper printers. The stamper printer is operative to apply ink marks to one or more surfaces of the check so as to indicate that the check has been cancelled or otherwise processed. In an exemplary embodiment the check is thereafter moved into a vertically extending transport. As the check enters the vertical transport, printing is conducted on the check through operation of a suitable inkjet or other printer. Appropriate printing is applied to the check to indicate it has

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been cancelled or otherwise processed as the check moves past the inkjet printer. Of course printing of various indicia may be applied when other types of documents are processed.

In the exemplary embodiment the inkjet printer has aligned on an opposed side of the transport therefrom, an ink catcher mechanism. The ink catcher mechanism of the exemplary embodiment includes a movable head. The movable head includes an opening therein such that the opening may be aligned with the ink spraying nozzles on the head of the inkjet printer so as to receive ink therein that is not deposited on the check or other document. The exemplary embodiment of the movable head also includes a wiper. The head is moved through operation of a motor or other moving device at appropriate times so that the wiper engages the head of the inkjet printer so as to minimize the buildup of ink and contaminants thereon. This facilitates accurate printing and helps to minimize the risk of potential damage to checks by the accumulation of excess ink within the machine.

Checks or other documents that move past the printer in the vertical transport are moved downward in the exemplary embodiment into a storage area. Once the documents have moved adjacent a lower surface of the storage area a transversely movable plunger mechanism is operative to engage the check and move it out of the vertical transport. In an exemplary embodiment the plunger mechanism is operative to be movable such that the check can be either moved into a storage location on either transverse side of the vertical transport. Once the check is moved out of the transport by the plunger mechanism the check or other document may be held in intermediate relation between a pair of wall surfaces and a spring biased backing plate. As a result checks or other documents may be selectively moved by the plunger mechanism for storage in a selected one of the locations in the storage area.

Various approaches may be taken in the operation of automated banking machines for storing documents that are received by the document accepting mechanism. For example in some embodiments the mechanism may only accept checks. In such embodiments the machine may operate in accordance with its programming to segregate checks that are drawn on the particular institution owning the banking machine that receives the check, from checks that are drawn on other institutions. Alternatively the banking machine may be programmed to store valid checks in one compartment and suspect checks in another compartment. Alternatively in some other embodiments the document accepting mechanism may store multiple types of documents. For example in a banking machine that accepts currency bills and checks through the mechanism, bills may be stored in one compartment while checks are stored in another. Various approaches may be taken based on the programming of the particular automated banking machine.

In an alternative embodiment the automated banking machine includes a sheet access area which is operative to accept a stack including a plurality of sheets from a machine user. The sheet access area is bounded by a first sheet driver member and an opposed second sheet driver member. At least one divider plate extends vertically intermediate of the first and second sheet driver members. The at least one divider plate and second sheet driver member are relatively movable with respect to the first sheet driver member. The at least one divider plate is operative to separate a first side from a second side of the sheet access area.

In the exemplary embodiment, a first side of the sheet access area is operative to receive a stack of sheets from the machine user. The first side is in operative connection with a sheet picker that separates each sheet individually from the

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stack. The picker delivers each individual sheet to a transport in the sheet processing device which is alternatively referred to herein as a deposit accepting device. The sheet processing device is operative in conjunction with the machine to determine whether each of the sheets is acceptable, and if so acceptable sheets are accepted and stored in the machine. If not, the sheets are moved back toward the sheet access area. In the exemplary embodiment, a diverter moves and/or directs sheets to be delivered out of the machine from the at least one sheet processing device to the second side of the divider plate. In the exemplary embodiment the first sheet driver member and the second sheet driver member are operative to act through at least one opening in the at least one divider plate to move sheets both on the first side and the second side of the divider plate. Sheets to be returned to the ATM user are moved by the first and second sheet driving members out of the sheet opening of the machine for delivery to the user.

In still other embodiments, radiation type sheet detectors are used in conjunction with the at least one divider plate to detect sheets on the first side and on the second side. A further radiation type sheet detector is used to detect sheets that may be present on either the first side or the second side. This is accomplished in an exemplary embodiment through the use of an angularly reflective piece in operative supported connection with at least one divider plate. The angularly reflective piece is operative to reflect radiation. The radiation in the exemplary embodiment is received and reflected at an acute angle relative to the divider plate. This enables a sensor including an emitter and receiver combination to be positioned transversely away from the divider plate. This enables successfully determining whether sheets are present on a particular side of the divider plate.

Further in the exemplary embodiment the at least one divider plate includes at least one aperture. At least one sensor includes a radiation emitter on a first side of the aperture and a radiation receiver on a second side of the aperture. Signals from this sensor are used by at least one processor in the machine to determine if sheets are present in the sheet access area either on the first side or the second side of the divider plate. As can be appreciated, in this embodiment at least one processor is operative to determine the presence of sheets and where they are in the sheet access area. This is possible because the sensor that senses radiation through the aperture is operative to determine if any sheets are present in the sheet access area regardless of whether they are on the first side or the second side of the divider plate. Further the radiation sensor is operative to sense radiation reflected from the radiation reflective piece. The signals corresponding to the magnitude of radiation sensed are used by at least one processor in the machine to determine if sheets are present on the side associated with the radiation reflective piece. As a result this exemplary arrangement enables determining if sheets are present and where they are located. Further in other exemplary embodiments the reflective piece may be used in connection with sheet engaging pieces in each of the first side and the second side. Further additional sensors may be used of the reflective or through type to determine sheet position in alternative embodiments.

In still other exemplary embodiments a sheet storage and retrieval device such as a belt recycler device may be used. The sheet storage and retrieval device may be used to store sheets that are being held pending determination whether they are suitable for storage in the machine, or should be returned to the customer. The first sheet storage and retrieval device may be used to selectively deliver sheets either to the sheet access area for return to the customer or for delivery to a sheet storage area.

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In other exemplary embodiments a second sheet storage and retrieval device is positioned in operatively intermediate relation of the first sheet storage and retrieval device and the sheet access area. In some exemplary embodiments sheets stored in escrow in the first sheet storage and retrieval device are moved in a sheet path toward the sheet access area. A divider in operative connection with the sheet path is operative to divert sheets that are determined to have at least one property which indicates they should be stored in the machine, for storage in the second sheet storage and retrieval device. Those sheets that are to be returned to the customer are moved in the sheet path and are directed by the diverter to the second storage area for return to the customer. Sheets to be retained in the machine stored on the second sheet storage and retrieval device can be then moved therefrom into suitable storage areas in the machine. This may include for example in some embodiments, check storage areas or note storage areas. In some exemplary embodiments the first sheet storage and retrieval device and the second sheet storage and retrieval device may each comprise a belt recycling device. Of course in other embodiments other devices operative to store and deliver sheets may be used. Further in some embodiments note storage areas in the machine may be in operative connection with recycling devices which are operative to selectively deliver notes stored therein. Such recycling devices may be part of the cash dispenser device in the automated banking machine.

In still other exemplary embodiments the sheet processing device in the machine may include in combination with a device for aligning sheets with the sheet path, at least one transversely movable magnetic read head. In the exemplary embodiment, the device includes one relatively fixed magnetic read head and one magnetic read head that are selectively movable. The sheet processing device further includes at least one sensor that is operative to sense the width of each check that is received in the machine. The at least one sensor is operative to sense the width after the check has been positioned and aligned relative to the direction of the sheet path. In the exemplary embodiment the alignment of the check in the sheet path is operative to position the check so that if the check is in a first physical orientation, magnetic characters in the micr line will pass adjacent the fixed magnetic read head. Further in the exemplary embodiment, based on the sensed width of the check, the movable magnetic read head is positioned through operation of a positioning device to move transversely in the sheet path to a selected transverse position in the sheet path. If the check is in a second orientation indicia included in the micr line of the check will pass adjacent the second magnetic read head. As a result in the exemplary embodiment, the magnetic read heads are positioned for each check regardless of the facing position of the check such that at least one of the magnetic read heads will be positioned to capture signals corresponding to micr line indicia on the check. In other exemplary embodiments both magnetic read heads may be selectively movable so as to assure reading of indicia.

Numerous types of novel systems and methods are taught by the disclosure hereof.

## BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an isometric view of an exemplary deposit accepting apparatus shown in an open condition for servicing.

FIG. 2 is an opposite hand isometric view of the deposit accepting apparatus shown in FIG. 1.

FIG. 3 is a schematic view of the devices included in the deposit accepting apparatus.

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FIG. 4 is a top isometric view of a portion of an upper platen including elements of a first transport which moves documents in a first longitudinal direction in the deposit accepting apparatus and second transports which move documents in a direction transverse to the first direction.

FIG. 5 is a side view of the platen and first and second drives shown in FIG. 4.

FIG. 6 is a bottom view corresponding to FIGS. 4 and 5 showing the platen with rolls of the first and second transports extending therethrough.

FIG. 7 is a top plan view of an upper platen and a lower platen of a transport mechanism of the exemplary deposit accepting apparatus.

FIG. 8 is a front view showing the positions of the first and second transports corresponding to FIG. 7.

FIG. 9 is a view similar to FIG. 7 with the transports operating to move a document in a first direction.

FIG. 10 is a front view of the first and second transports corresponding to FIG. 9.

FIG. 11 is a view similar to FIG. 9 with the document moved further into the deposit accepting apparatus.

FIG. 12 is a front plan view showing the positions of the first and second transports.

FIG. 13 is a view similar to FIG. 11 showing the document moved in a second direction transverse to the first direction.

FIG. 14 is a front plan view showing the relative positions of the first and second transports when a document is moved in a transverse direction.

FIG. 15 is a view similar to FIG. 13 showing an edge of the document aligned with the non-contact sensors.

FIG. 16 corresponds to FIG. 15 and shows the positions of the first and second transports.

FIG. 17 is a view similar to FIG. 15 but showing an alternative document including a folded edge.

FIG. 18 is a front view of the first and second transports corresponding to FIG. 17.

FIG. 19 is an isometric view showing the movable mounting of the exemplary magnetic read head of the embodiment.

FIG. 20 is a partially sectioned view corresponding to FIG. 19 further showing the movable mounting for the magnetic read head.

FIG. 21 is a cross-sectional side view of the mounting for the magnetic read head as shown in FIG. 19.

FIG. 22 is an isometric view showing an ink catcher mechanism of an exemplary embodiment.

FIG. 23 is a partially exploded view showing the movable head disposed from the body of the ink catcher.

FIG. 24 is an exploded isometric view showing the body of the ink catcher of FIG. 22.

FIG. 25 is a partially exploded view of an exemplary form of the stamper printer used in the exemplary embodiment.

FIG. 26 is another exploded view of the exemplary stamper printer.

FIG. 27 is a side view showing the eccentric profile of the exemplary embodiment of the printing roll of the stamper printer.

FIG. 28 is an isometric view of the storage compartment of the alternative deposit accepting mechanism shown with the storage compartment having its access door in an open position.

FIG. 29 is an isometric view of the guide of the vertically extending transport that extends in the storage area.

FIG. 30 is a side view of the vertically extending transport that extends in the storage area of the exemplary deposit accepting apparatus.

FIG. 31 is an isometric view of the apparatus shown accepting a document into the vertically extending transport.

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FIGS. 32 through 35 show the sequential movement of an exemplary plunger member as it operates to move a document held in the vertically extending transport into a storage location positioned on the left side of the storage mechanism as shown.

FIG. 36 is an isometric view similar to FIG. 31 showing the vertical transport of the accepting a document therein.

FIGS. 37 through 40 show the sequential movement of the exemplary plunger member to move a document in the vertical transport to a storage location on the right side of the vertical transport as shown.

FIG. 41 is a schematic view showing an automated banking machine with an alternative exemplary deposit accepting device.

FIG. 42 is a schematic view of an exemplary deposit accepting device of the type shown in the automated banking machine of FIG. 41.

FIG. 43 is a plan view of an exemplary platen in a document alignment area of the alternative deposit accepting device.

FIG. 44 is a view similar to FIG. 43 but including portions of a check therein showing the location of the indicia included in the micr line in the four possible orientations of a check in the document alignment area.

FIG. 45 is an isometric view showing an exemplary movable micr read head.

FIGS. 46 and 47 are schematic views of an exemplary sheet access area in a position prior to accepting a stack of sheets.

FIGS. 48 and 49 are views of the sheet access area receiving the stack of sheets.

FIGS. 50 and 51 show the sheet access area while moving the stack of sheets toward a picker.

FIGS. 52 and 53 show the sheet access area after the stack of sheets is accepted therein and a gate mechanism is closed.

FIGS. 54 and 55 show the stack of documents while the stack is moving into a position adjacent the picker.

FIGS. 56 and 57 show the sheet access area with the upper sheet driving member disposed away from the stack.

FIGS. 58 and 59 show the sheet access area receiving a rejected sheet while still holding some sheets from the original input stack.

FIGS. 60 and 61 show the sheet driver members operating to move sheets out of the sheet access area in which the sheets are positioned on both sides of the divider plate.

FIGS. 62 and 63 show sheets on each side of the divider plate that have been presented to the customer in a position being returned into the machine, which may be done for example in response to the machine user not taking the sheets.

FIGS. 64 and 65 show retracted sheets being picked for storage in the machine through operation of the picker.

FIGS. 66 and 67 show the sheet access area operating to deliver a stack of sheets to a user such as a stack of rejected checks.

FIG. 68 shows an exemplary sensor arrangement of the sheet access area.

FIG. 69 is a plan view of an exemplary divider plate.

#### DESCRIPTION OF EXEMPLARY EMBODIMENTS

U.S. Pat. No. 6,474,548 the disclosure of which is incorporated herein by reference, discloses an exemplary deposit accepting device of a card activated cash dispensing automated banking machine. For purposes of this disclosure a deposit accepting device shall be construed to encompass any apparatus which senses indicia on documents input to an automated banking machine.

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A deposit accepting device 420 of an exemplary embodiment and having the features described hereafter is shown in FIG. 1. The deposit accepting device is shown with the mechanism open so as to enable more readily describing its components. The deposit accepting mechanism would be open in the manner shown in FIGS. 1 and 2 only when the device is not in operation. Rather the device would be placed in the open condition for servicing activities such as clearing jams, cleaning, adjusting or replacing components. This can be readily done in this exemplary embodiment by a servicer as later described.

The deposit accepting device includes a document inlet opening 422. In the exemplary embodiment during operation the inlet opening is in communication with the outside of the housing of the automated banking machine. Documents received through the inlet opening travel along a transport path in the device. The transport path in the device further includes a document alignment area 424 in which documents are aligned to facilitate the processing thereof. The exemplary form of the unit further includes a document analysis area 426. The exemplary document analysis area includes scanning sensors and magnetic sensors for purposes of reading indicia from the documents.

The exemplary form of the device further includes an escrow area 428 along the transport path. In the escrow area documents that have been received are stored pending determination to either accept the documents or return them to the user. The exemplary deposit accepting device further includes a storage area 430 which operates to store documents that have been accepted for deposit within the deposit accepting device. Of course it should be understood that this structure is exemplary of arrangements that may be used.

In the exemplary embodiment documents are received through the opening and the presence of a document is sensed by at least one sensor 432. Sensing a document at the opening at an appropriate time during ATM operation (such as at a time when a user indicates through an input device of the machine that they wish to input a document) causes at least one processor to operate so as to control a gate 434. The processor operates upon sensing the document to cause the gate to move from the closed position to the open position. This is accomplished in the exemplary embodiment by a drive such as an electric motor or solenoid moving an actuator member 436 as shown in FIG. 1. The actuator member 436 includes a cam slot 438 which causes corresponding movement of the gate 434 to the desired position. In some embodiments the at least one sensor 432 or other sensor in the device is operative to sense properties that would indicate whether the document being inserted is a double or other multiple document. At least one processor in the banking machine may operate in accordance with its programming to not accept multiple documents and to cause the banking machine to provide at least one output to advise the user to insert a single document.

Responsive to the sensing of the document and other conditions as determined by at least one processor, a first transport 440 operates to move the document into the document alignment area. In the exemplary embodiment the document is moved in engaged relation between a belt flight 442 and rollers 444. As best shown in FIGS. 1 and 4, rollers 444 extend in openings 446 in an upper platen 448 to engage or at least move in very close proximity to belt flight 442. As shown in FIG. 4, rollers 444 are mounted on a movable carriage 450. Carriage 450 is movable rotationally about a shaft 452. Movement of the carriage 450 enables selectively positioning of the rollers 444 to be in proximity to the surface of belt flight 442 or to be disposed away therefrom for reasons that are later

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discussed. After the document is sensed as having moved into the device the processor operates to cause the gate to be closed. Alternatively if a user has provided inputs through input devices on the machine indicating that they will be depositing more documents in the machine, the gate may remain open until the last document is deposited.

As shown in FIG. 4 through 6, platen 448 in the operative position is in adjacent relation with a lead in guide 454. Guide portion 454 and platen 448 include corresponding contoured edges 456, 458. The contoured edges of the exemplary embodiment are of a toothed contoured configuration. This configuration is used in the exemplary embodiment to reduce the risk that documents will become caught at the adjacent edges of the platen and the guide. The toothed contoured configuration of the adjacent surfaces helps to minimize the risk that documents catch or are folded or damaged as they pass the adjacent surfaces. Of course it should be understood that this approach is exemplary and in other embodiments other approaches may be used.

In the exemplary embodiment the document alignment area includes transverse transport rolls 460 and 462. The transverse transport rolls extend through apertures in the platen 464 that supports belt flight 442. The transverse transport rolls of the exemplary embodiment are configured to have axially tapered surfaces extending in each longitudinal direction from the radially outermost extending portion of the roll so as to minimize the risks of documents being caught by a surface thereof. In alternative embodiments transverse transport rolls may have simple or compound curved surfaces to minimize the risk of catching transversely moving documents, which configurations shall also be referred to as tapered for purposes of this disclosure. In the exemplary embodiment the upper surface of the transverse transport rolls are generally at about the same level as the upper surface of belt flight 442. In addition each of the transverse transport rolls are in operative connection with a drive device. The drive device of the exemplary embodiment enables the transverse transport rolls to move independently for purposes of aligning documents as later discussed.

In supporting connection with platen 448 are a pair of transverse follower rolls 466 and 468. The transverse follower rolls each extend in a corresponding opening in the platen 448. Transverse follower roll 466 generally corresponds to the position of transverse transport roll 460. Likewise transverse follower roll 468 corresponds to the position of transverse transport roll 462. As shown in FIG. 4, rolls 466 and 468 are supported on a movable carriage 470. Carriage 470 is rotatably movable about shaft 452. A drive 472 is selectively operative responsive to operation of one or more processors in the banking machine to cause the movement of carriage 470 and carriage 450. The drive may be a suitable device for imparting movement, such as a motor or a solenoid. As a result, drive 472 of the exemplary embodiment is selectively operative to dispose rollers 444 adjacent to belt flight 442 or dispose the rollers therefrom. Likewise drive 472 is selectively operative to place transverse follower rolls 466 and 468 in adjacent relation with transverse transport rolls 460 and 462. These features are useful for purposes of aligning documents as will be later discussed. Of course this approach to a transverse transport for documents is exemplary and in other embodiments other approaches may be used.

The document alignment area 424 further includes a plurality of alignment sensors 474. In the exemplary embodiment non-contact sensors are used, which can sense the document without having to have any portion of the sensor contact the document. The exemplary alignment area includes three

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alignment sensors that are disposed from one another along the transport direction of belt flight 442. In the exemplary embodiment one sensor is aligned transversely with each of rolls 460 and 462 and a third sensor is positioned intermediate of the other two sensors. The alignment sensors of the exemplary embodiment are radiation type and include an emitter and a receiver. The sensors sense the documents that move adjacent thereto by detecting the level of radiation from the emitter that reaches the receiver. It should be understood that although three alignment sensors are used in the exemplary embodiment, other embodiments may include greater or lesser numbers of such sensors. Further while the alignment sensors are aligned along the direction of document transport path in the exemplary embodiment, in other embodiments other sensor arrangements may be used such as a matrix of sensors, a plurality of transversely disposed sensors or other suitable arrangement.

The operation of the document alignment area will now be described with reference to FIGS. 8 through 18. In the exemplary embodiment when a document is sensed entering the device, carriage 450 which is controlled through the drive 472 is positioned such that rollers 444 are positioned in adjacent relation to belt flight 442. This position is shown in FIG. 8. In this document receiving position carriage 470 is moved such that the transverse follower rolls 466 and 468 are disposed away from the transverse transport rolls 460 and 462.

In response to sensing a document 476 being positioned in the inlet opening 422 and other appropriate conditions, the at least one processor is operative to cause the first transport 440 to move belt flight 442. If a double or other multiple document is sensed the first transport may not run or may run and then return the document to the user as previously discussed. Moving belt flight 442 inward causes the first document to be moved and engaged with the transport in sandwiched position between the rollers 444 and the belt flight as shown in FIG. 9. In this position the transverse transport and transverse follower rolls are disposed away from one another so that the document 476 can move in engagement with the first transport into the document alignment area. The tapered surfaces of the transverse transport rolls 460, 462 facilitate the document moving past the rolls without snagging. It should also be noted that projections on the surface of platen 464 operate to help to move the document by minimizing the risk of the document snagging on various component features. Further the projections on the platen help to minimize the effects of surface tension that might otherwise resist document movement and/or cause damage to the document. Of course these approaches are exemplary, and other embodiments may employ other approaches.

Position sensors for documents are included in the document alignment area and such sensors are operative to sense when the document has moved sufficiently into the document alignment area so that the document can be aligned. Such sensors may be of the radiation type or other suitable types. When the document 476 has moved sufficiently inward, the first transport is stopped. In the stopped position of the transport, the drive 472 operates to move carriage 470 as shown in FIG. 12. This causes the transverse transport and follower rolls to move adjacent with the document 476 positioned therebetween so as to engage the document.

Thereafter as shown in FIGS. 13 and 14 the drive 472 is operative to move the carriage 450. This causes the rollers 444 to be disposed from belt flight 442 which disengages this transport with respect to the document. Thereafter the one or more drives which are operative to move the transverse transport rolls, operate responsive to at least one processor so as to move document 476 in a direction transverse to the direction

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of prior movement by belt flight 442 as well as to deskew the document. As shown in FIG. 15, the document 476 is moved sideways until a longitudinal edge 478 is aligned with the alignment sensors 474. In the exemplary embodiment the alignment sensors 474 provide a virtual wall against which to align the longitudinal edge of the document. The sensing of the document by the alignment sensors 474 of the edge of the document enables precise positioning of the document and aligning it in a desired position which facilitates later reading indicia therefrom. In an exemplary embodiment in which the documents are checks, the precise alignment of the longitudinal edge enables positioning of the document and its micr line thereon so as to be in position to be read by a read head as later discussed. Of course in other embodiments other approaches may be used.

In some exemplary embodiments the alignment sensors are in operative connection with one or more processors so that the transports are controlled responsive to the sensors sensing a degree of reduction in radiation at a receiver from an associated emitter of a sensor as the document moves toward a blocking position relative to the sensor. The exemplary embodiment may be configured such that a drive operating the transverse transport roll may cease to further move the sheet transversely when the alignment sensor which is transversely aligned with the transport roll senses a certain reduction in the amount of radiation reaching the sensor from the emitter. Thereafter the other drive operating the other transverse transport roll may continue to operate until the alignment sensor that corresponds to that transport roll senses a similar degree of reduction. In this way the processor operating the independently controlled transverse transport rolls cause the longitudinal edge of the document to be aligned with the virtual wall produced through use of the sensors.

In alternative embodiments the apparatus may operate in accordance with its programming to cause the respective transverse transport rolls to move the document transversely such that a reduction in radiation from the respective emitter is sensed reaching the corresponding receiver until no further reduction occurs. This corresponds to a condition where the document fully covers the corresponding receiver. Thereafter the respective drive for the transverse transport roll may be reversed in direction to a desired level such as, for example, fifty percent of the total reduction which would indicate that the transverse edge is positioned to cover approximately fifty percent of the receiver. In this way this alternative embodiment may be able to align documents that have relatively high radiation transmissivity or transmissivity that is variable depending on the area of the document being sensed by the sensor. Alternatively a transverse linear array of sensors, such as CCDs may be used to determine the transverse position of a particular portion of the edge of the sheet. Alternatively a plurality of transversely extending arrays of sensors may be used to sense the positions of one or more portions of one or more edges of the sheet. A plurality of spaced arrays may be used to sense the position of the sheet. Of course these approaches are exemplary and in other embodiments other approaches may be used.

Once the document has been aligned and moved to the position shown in FIG. 15, the drive 472 operates to move the carriage 450 such that the rollers 444 are again moved adjacent to belt flight 442. Thereafter the drive moves the carriage 470 so as to dispose the transverse follower rolls 466 and 468 away from the transverse transport rolls. This position is shown in FIG. 8. Thereafter the now aligned document can be further moved along the transport path through movement of the first transport out of the document alignment area of the device to the document analysis area.

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FIGS. 17 and 18 disclose an operational feature of the exemplary embodiment where a document 480 has a folded edge. In this exemplary situation the folded edge is configured so that the alignment sensor 474 which corresponds to transverse transport roll 462 cannot sense a longitudinal edge of the document until the document is unduly skewed. However, in this situation the middle alignment sensor will be operative to sense the middle portion of the longitudinal edge as will the alignment sensor that corresponds to transverse transport roll 460 before sensor 474 senses the edge of the document. In the exemplary embodiment the at least one processor that controls the operation of the drives for the transverse transport rolls is operative to control movement of the document transversely when the middle alignment sensor 15 senses the edge of the document even through one of the end sensors has not. This is true even for a folded document or a document that has been torn. The at least one processor controls each transverse roll to move the document transversely until two of the three sensors detect edge of the document 20 in the desired aligned position. In this way even such an irregular document is generally accurately aligned in the longitudinal direction from the transport.

It should be understood that the exemplary embodiment uses radiation type sensors for purposes of aligning the document in the alignment section. In other embodiments other types of sensors such as sonic sensors, inductance sensors, air pressure sensors or other suitable sensors or combinations thereof, may be used.

Once the document has been aligned in the document alignment area of the transport path, the deposit accepting device operates responsive to the programming associated with one or more processors, to cause the document to be moved along the transport path by the first transport into the document analysis area. In the exemplary embodiment the document analysis area includes at least one magnetic sensing device which comprises the magnetic read head 482. Magnetic read head 482 is in supporting connection with platen 448 and in the exemplary embodiment is movable relative thereto. The alignment of the document in the document alignment area is operative in the exemplary embodiment to place the micr line on the check in corresponding relation with the magnetic read head. Thus as the document is moved by the first transport into the document analysis area, the micr line data can be read by the magnetic read head. Of course in some alternative embodiments micr or other magnetic indicia may be read through other magnetic sensing elements such as the type later discussed, or optically, in the manner shown in U.S. Pat. No. 6,474,548, for example.

FIGS. 19 through 21 show an exemplary form of the movable mounting for the magnetic read head 482. In the exemplary embodiment the magnetic read head is positioned in a retainer 484. Retainer 484 includes a first projection 486 that extends in and is movable in an aperture 488. Retainer 484 also includes a projection 490 which is movable in an aperture 492. A tension spring 494 extends through a saddle area 496 of the housing 484. The saddle area includes two projections which accept the spring 494 therebetween. This exemplary mounting for the magnetic read head provides for the head to float such that it can maintain engagement with documents that are moved adjacent thereto. However, the movable character of the mounting which provides both for angular and vertical movement of the read head reduces risk of snagging documents as the documents move past the read head. Further the biased spring mounting is readily disengaged and enables readily replacing the magnetic read head in situations where that is required. Of course this approach is exemplary and in other embodiments other approaches may be used.

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The exemplary document analysis area includes in addition to the read head a magnetic sensing element **498**. The magnetic sensing element in some exemplary embodiments may read magnetic features across the document as the document is moved in the document analysis area. In some embodiments the magnetic reading device may be operative to read numerous magnetic features or lines so as to facilitate the magnetic profile of the document as discussed herein. In some embodiments the magnetic sensing element may sense areas of the document in discrete elements which provide a relatively complete magnetic profile of the document or portions thereof. In some embodiments the magnetic sensing capabilities may be sufficient so that a separate dedicated read head for reading the micr line of checks is not required. Of course these approaches are exemplary and may vary depending on the type of documents which are being analyzed through the system.

The exemplary document analysis area further includes a first scanning sensor **500** and a second scanning sensor **502**. The scanning sensors are operative to sense optical indicia on opposed sides of the document. The scanning sensors in combination with at least one processor are operative to produce data which corresponds to a visual image of each side of the document. This enables analysis of visual indicia on documents through operation of at least one processor in the ATM. In the case of checks and other instruments the scanning sensors also enable capturing data so as to produce data which corresponds to image of a check which may be used for processing an image as a substitute check, and/or other functions.

In some embodiments, the data corresponding to images of the documents may be used by the ATM to provide outputs to a user. For example, an image of a check may be output through a display screen of the ATM so a user may be assured that the ATM has captured the image data. In some cases at least one processor in the ATM may apply digital watermarks or other features in the data to minimize the risk of tampering. In some embodiments at least one processor may operate in accordance with its programming to indicate through visual outputs to a user with the image that security features have been applied to the image data. This may include outputs in the form of words and/or symbols which indicate a security feature has been applied. This helps to assure a user that the ATM operates in a secure manner in processing the accepted check. Of course, this approach is exemplary of things that may be done in some embodiments.

In alternative embodiments the programming of one or more processors associated with the ATM may enable the scanning sensors, magnetic sensors and other sensing elements to gather data which is usable to analyze other types of documents. Other types of sensing elements may include, for example, UV, IR, RFID, fluorescence, RF and other sensors that are capable of sensing properties associated with document. Documents may include for example receipts, certificates, currency, vouchers, gaming materials, travelers checks, tickets or other document types. The data gathered from the sensors in the analysis area may be processed for purposes of determining the genuineness of such items and/or the type and character thereof. Of course the nature of the sensors included in the analysis area may vary depending on the type of documents to be processed by the device. Also some embodiments may operate so that if a micr line or other magnetic characters on the document are not aligned with the magnetic read head, the document can nonetheless be analyzed and processed using data from other sensors.

It should also be noted that documents are moved in the document analysis area through engagement with a plurality

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of driving rolls **504**. The driving rolls **504** operate in response to one or more drives that are controlled responsive to operation of one or more processors in the ATM. The drives are operative to move documents into proximity with and past the sensors so as to facilitate the reading of indicia thereon. The document may be moved in one or more directions to facilitate the reading and analysis thereof.

Once a document has been moved through the document analysis area, the document passes along the transport path **10** into escrow area **428**. Escrow area **428** includes a third transport **506**. Transport **506** includes an upper belt flight **508**. The plurality of cooperating rollers **510** supported through platen **449** are positioned adjacent to belt flight **508** in the operative position. Documents entering the escrow area are moved in **15** engagement with belt flight **508** and intermediate to belt flight and the rollers.

In the exemplary embodiment documents that have been passed through the document analysis area are moved in the escrow area where the documents may be stopped for a period **20** of time during which decisions are made concerning whether to accept the document. This may include for example, making a determination through operation of the ATM or other connected systems concerning whether to accept an input check. If it is determined that the check should not be accepted, the direction of the transports are reversed and the check is moved from the escrow area through the document analysis area, the document alignment area and back out of the ATM to the user. Alternatively if the decision is made to accept the document into the ATM, the document is moved in **25** a manner later discussed from the escrow area to the document storage area of the device.

In some exemplary embodiments the escrow area may be sufficiently large to hold several checks or other documents therein. In this way a user who is conducting a transaction involving numerous checks may have all those checks accepted in the machine, but the programming of the machine may enable readily returning all those checks if the user elects to do so or if any one or more of the documents is determined to be unacceptable to the machine. Alternatively or in addition, storage devices such as belt storage mechanisms, transports or other escrow devices may be incorporated into the transport path of a deposit accepting device so that more numerous documents may be stored therein and returned to the user in the event that a transaction is not authorized to proceed. Of course these approaches are exemplary.

It should be noted that the exemplary escrow area includes a lower platen with a plurality of longitudinal projections which extend thereon. The longitudinal projections facilitate movement of the document and reduce surface tension so as to reduce the risk of the document being damaged.

In the exemplary embodiment the escrow area further includes a stamper printer **512**. In the exemplary embodiment the stamper printer is supported through platen **449** and includes an ink roll type printer which is described in more detail in FIGS. **25** through **27**. The escrow area further includes a backing roll **514** which operates to assure that documents move in proximity to the stamper printer so that indicia can be printed thereon.

The exemplary form of the stamper printer is shown in greater detail in FIGS. **25** through **27**. The exemplary printer includes an eccentric ink bearing roll **518** shown in FIG. **27**. The eccentric shape of the ink bearing roll in cross section includes a flattened area **520** which is disposed radially closer to a rectangular opening **522** which extends in the roll, than a printing area **524** which is angularly disposed and in opposed relation thereof. The flattened area is generally positioned adjacent to documents when documents are moved through **60**

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the escrow area and printing is not to be conducted thereon by the stamper printer. In the exemplary embodiment the ink roll 518 is encapsulated in plastic and is bounded by a plastic coating or cover about its circumference. Apertures or openings are cut therethrough in the desired design that is to be printed on the documents. As can be appreciated, the apertures which are cut in the plastic which encapsulates the outer surface of the ink bearing roll enables the ink to be transferred from the ink holding roll material underlying the plastic coating, to documents in the shape of the apertures. For example in the embodiment shown a pair of angled lines are printed on documents by the stamper printer. Of course this approach is exemplary and in other embodiments other types of inking mechanisms and/or designs may be used.

In the exemplary embodiment the ink roll 518 is supported on a first shaft portion 526 and a second shaft portion 528. The shaft portions include rectangular projections that are generally rectangular in profile 523, that extend in the opening 522 of the ink roll. The shaft portions include flanged portions 530 and 532 that are disposed from the radial edges of the roll. Shaft portions 526 and 528 include an interengaging projection 525 and access 527, as well as a tab 529 and recess that engage and serve as a catch, which are operative to engage and be held together so as to support the roll.

Shaft portion 526 includes an annular projection 534. Annular projection 534 is adapted to engage in a recess which is alternatively referred to as a slot (not separately shown) which extends generally vertically in a biasing tab 536 as shown in FIG. 25. Biasing tab 536 is operative to accept the projection in nested relation and is operative to provide an axial biasing force against shaft portion 526 when the first shaft portion is positioned therein. This arrangement enables holding the shaft portion in engaged relation with the biasing tab. However, when it is desired to change the stamper printer and/or the ink roll therein, the biasing tab may be moved such that the annular projection may be removed from the interengaging slot by moving the projection 534 upward in the recess so as to facilitate removal of the printer and ink roll. The biasing tab is supported on a bracket 538 that is in supporting connection with the platen which overlies the escrow area.

Second shaft portion 528 includes an annular projection 540. Projection 540 includes on the periphery thereof an angled radially outward extending projection 542. Projection 542 has a particular contour which is angled such that the transverse width of the projection increases with proximity to the flange portion 542. This configuration is helpful in providing a secure method for moving the ink roll but also facilitates changing the ink roll and stamper printer when desired.

In the exemplary embodiment the ink roll 518 is housed within a housing 544. Housing 544 is open at the underside thereof such that the printing area 524 can extend therefrom to engage a document from the escrow area. Housing 544 also includes two pairs of outward extending ears 546. Ears 546 include apertures therein that accept housing positioning projections 545 on the associated mounting surface of the device and are operative to more precisely position the housing and the ink roll on the supporting platen and to facilitate proper positioning when a new ink roll assembly is installed. Housing 544 also includes apertures 543 through which the shaft portions extend. A flange portion is positioned adjacent to each aperture.

In the exemplary embodiment shaft portion 528 is driven through a clutch mechanism 548. Clutch mechanism 548 of the exemplary embodiment is a wrap spring clutch type mechanism which is selectively actuatable through electrical signals. The clutch is driven from a drive through a gear 550.

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The clutch 548 outputs rotational movement through a coupling 552. Coupling 552 includes the annular recess that corresponds to projection 540 and a radial recess which corresponds in shape to projection 542. Thus in the exemplary embodiment the force of the biasing tab enables the coupling 552 to solidly engage shaft portion 528.

During operation gear 550 which is operatively connected to a drive provides a mechanical input to the clutch 548. However, the ink roll generally does not rotate. Transport 506 is operative to move a document in the transport in the escrow area responsive to signals from a processor. Sensors such as radiation sensors in the escrow area are operative to indicate one or more positions of the document to the processor. When the document is to be marked with the stamper printer it is positioned adjacent to the ink roll by operation of a processor controlling the transport in the escrow area. A signal is sent responsive to the processor to the clutch 548. This signal is operative to engage the coupling 552 which causes the shaft portions 528 and 526 to rotate the ink roll 518. As the ink roll rotates the printing area 524 engages the surface of the document causing ink markings to be placed thereon. The ink roll rotates in coordination with movement of the document. The clutch is operative to cause the coupling to carry out one rotation such that after the document has been marked, the printing area is again disposed upward within the housing. The flattened portion 520 of the ink roll is again disposed in its initial position facing the document. Thus documents are enabled to pass the stamper printer 512 without having any unwanted markings thereon or without being snagged by the surfaces thereof.

It should be understood that when it is desired to change the stamper printer ink roll because the ink thereon has become depleted or alternatively because a different type of marking is desired, this may be readily accomplished. A servicer does this by deforming or otherwise moving the biasing tab 536 and moving the shaft portion 526 upward such that the annular projection 534 no longer extends in the slot in the biasing tab. This also enables projection 534 to be moved upward and out of a stationary slot 554 in the bracket 538. As the annular projection 534 is moved in this manner the annular projection 540 and radial projection 542 are enabled to be removed from the corresponding recesses in the coupling 552. This enables the housing 544 to be moved such that the ears 546 on the housing can be separated from the positioning projections which help to assure the proper positioning of the ink roll when the housing is in the operative position. Thereafter a new housing shaft and ink roll assembly can be installed. This may be accomplished by reengaging the projections 540 and 542 with the coupling 552 and engaging the projection 534 in the slot of biasing tab 536. During such positioning the positioning projections are also extended in the ears 546 of the housing, to locate the housing and reliably position the ink roll.

It should further be understood that although only one ink roll is shown in the exemplary embodiment, alternative embodiments may include multiple ink rolls or multiple stamper printers which operate to print indicia on checks. Such arrangements may be used for purposes of printing varied types of information on various types of documents. For example in some situations it may be desirable to return a document that has been processed through operation of the device to the user. In such circumstances a stamper printer 65 may print appropriate indicia on the document such as a "void" stamp or other appropriate marking. Of course the type of printing that is conducted may vary as is appropriate

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for purposes of the particular type of document that is being processed. In other embodiments alternative approaches may be used.

In the exemplary embodiment a document that is to be moved from the escrow area can be more permanently stored in the machine by moving the document to a storage area 430. Documents are moved from the escrow area toward the storage area by moving the document in engagement with belt flight 508 so that the document engages a curved deflector 554. Deflector 554 causes the document to engage a vertical transport 556 that extends in the storage area 430. As best shown in FIG. 30 vertical transport 556 includes two continuous belts that are driven by a drive 558. The transport 556 includes a pair of disposed belts, each of which has a belt flight 560. Each belt flight 560 extends in generally opposed relation of a corresponding rail 562 of a vertical guide 564. As shown in FIG. 29 guide 564 of the exemplary embodiment is constructed so that the rails 562 are biased toward the belt flights by a resilient material. This helps to assure the document can be moved between the belt flights and the rails in sandwiched relation. Such a document 568 is shown moving between the rails and the belt flights in FIG. 30. Alternatively in some embodiments a single belt flight, rollers or other sheet moving members may be used.

It should also be noted that in the exemplary embodiment the drive 558 includes a spring biasing mechanism 568. The biasing mechanism acts on lower rolls 570 to assure proper tension is maintained in the belt flights 560.

Further in the exemplary embodiment the transport belts are housed within a housing which includes a pair of spaced back walls 572. As later discussed, back walls 572 serve as support surfaces for stacks of documents that may be stored in a first section or location of the storage area of the device. Similarly guide 564 includes a pair of transversely disposed wall surfaces 574. Wall surfaces 574 provide support for a stack of documents disposed in a second section or location of the storage area. Also as shown in FIG. 30, the vertical transport 556 moves documents to adjacent a lower surface 576 which bounds the interior of the storage area. Document sensing devices are provided along the path of the vertical transport so that the drive 558 can be stopped through operation of at least one processor once the document has reached the lower surface. This helps to assure that documents are not damaged by movement in the drive. Of course these approaches are exemplary and in other embodiments other approaches may be used.

In the exemplary embodiment when at least some documents are moved from the escrow area into the vertical transport, the device operates to print indicia thereon. This may be indicia of various types as described herein, as would be appropriate for the types of documents being processed. In the exemplary embodiment printing on the documents is carried out through operation of an inkjet printer 578. The inkjet printer includes a removably mounted printhead that is adjacent to documents as they are moved in the vertical transport portion of the sheet path. The inkjet printer includes nozzles which are operative to selectively expel ink therefrom toward the sheet path and shoot ink onto the adjacent surface of the document. The nozzles of the inkjet printer operate in accordance with the programming of a processor which is operative to drive the inkjet printer to expel ink selectively therefrom to produce various forms of characters on the documents as may be desired. For example in an exemplary embodiment the printer may be operative to print indica on checks so as to indicate transaction information and/or the cancellation of such checks. In the exemplary embodiment the print head is

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releasably mounted through moveable members to enable ready installation and removal.

The exemplary embodiment further includes an ink catching mechanism 580 which is alternatively referred to herein as an ink catcher. In the exemplary embodiment the ink catching mechanism is operative to capture ink that may be discharged from the printhead at times when no document is present. This may occur for example if a document is misaligned in the transport or if the machine malfunctions so that it attempts printing when no document is present. Alternatively the inkjet printer may be operated responsive to at least one processor at times when documents are not present for purposes of conducting head cleaning activities or other appropriate activities for assuring the reliability of the inkjet printer. Further the exemplary embodiment of the ink catcher mechanism is operative to tend the printhead by wiping the nozzles so as to further facilitate reliable operation. Of course it should be understood that the exemplary ink catcher shown and described is only one of many ink catcher configurations that may be used.

An exemplary form of the ink catching mechanism is shown in FIGS. 22 through 24. The ink catching mechanism includes an ink holding body 582 with an ink holding area therein. Body 582 has thereon an annular projecting portion 584. Projecting portion 584 has an opening 586 therein. Opening 586 of the projecting portion is in fluid communication with the ink holding interior area of the main portion of the body. Of course this body configuration is merely exemplary.

A head portion 588 is comprised of a body portion configured to extend in overlying relation of the projecting portion 584. Head portion 588 of the exemplary embodiment comprises a generally annular body member that includes a flattened area 590 which has an opening 592 therein. Head portion 588 also has in supporting connection therewith a resilient wiper member 594 extending radially outward therefrom in an area disposed angularly away from the opening 592.

As shown in FIG. 24 the exemplary embodiment of body 582 is of a generally clamshell construction and includes a lower portion 596 and an upper portion 598. The upper and lower portions fit together as shown to form the body, including the annular projecting portion. Also housed within the interior of the exemplary embodiment of the body is an ink absorbing member 600. The ink absorbing member is operative to absorb ink which passes into the interior of the body through opening 586. The body is releasably mounted in the machine through a mounting portion 601 which accepts suitable fasteners or other holding devices.

In the operative condition the head portion 588 extends in overlying generally surrounding relation of the projecting portion 584. The head portion is enabled to be selectively rotated through operation of a drive 602 that is operatively connected therewith. A disk member 604 and sensor 606 are operative to sense at least one rotational position of the head portion 588.

In operation of the exemplary form of the device, the head portion 588 is generally positioned as shown in FIG. 22 with the opening 592 of the head portion in aligned relation with the opening 586 in the projecting portion of the body. The projecting portion extends within an interior area of the rotatable head portion. In this position ink expelled from the inkjet printhead which does not strike a document, passes into the interior of the body through the aligned openings. Thus for example if the programming of the machine calls for the machine to periodically conduct a head cleaning operation in which the nozzles of the inkjet printhead are fired, the ink can

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be transmitted through sheet path in the area of the transport where documents are normally present and into the body of the ink catcher mechanism. Thereafter or periodically in accordance with the programming of the machine, a processor in operative connection with the drive is operative to cause the drive 602 to rotate the head portion 588. Rotation of the head portion is operative to cause the flexible wiper member 594 to engage the print head and wipe over the openings of the inkjet nozzles. This avoids the buildup of ink which can prevent the efficient operation of the inkjet printer. Once the wiper has moved across the nozzles the head returns to the position so that excess ink is accepted within the body. This is done in the exemplary embodiment by having the head portion rotate in a first rotational direction about a full rotation. In this way the head portion rotates from the position where the openings in the head portion and projecting portion are aligned with the print head. The head portion is rotated so the openings are no longer aligned and the flexible wiper member engages the print head and wipes across the nozzles thereof. The head portion continues to rotate until the openings are again aligned.

In the exemplary embodiment the drive operates responsive to the at least one processor to rotate the head portion in the first rotational direction about 360 degrees and then stops. In other embodiments the drive may reverse direction and/or operate the head portion to undergo multiple rotations. In other embodiments the movable member may include multiple openings and wiper members and may move as appropriate based on the configuration thereof. In other embodiments the movable member may include multiple openings and wiper members and may move as appropriate based on the configuration thereof.

In some embodiments the at least one processor may operate the print head periodically to clean or test the print head, and may operate the ink catcher to wipe the nozzles only after such cleaning or test. In some alternative embodiments wiping action may be done after every print head operation or after a set number of documents have been printed upon. Various approaches may be taken in various embodiments.

In exemplary embodiments suitable detectors are used to determine when the print head needs to be replaced. At least one processor in operative connection with the print head may operate to provide an indication when the print cartridge should be changed. Such an indication may be given remotely in some embodiments, by the machine sending at least one message to a remote computer. In the exemplary embodiment a servicer may readily remove an existing print cartridge such as by moving one or more fasteners, tabs, clips or other members. A replacement cartridge may then be installed, and secured in the machine by engaging it with the appropriate members. In the exemplary embodiment electrical contacts for the print head are positioned so that when the cartridge is in the operative position the necessary electrical connections for operating the print head are made. The new cartridge is installed with the print head thereof positioned in aligned relation with the opening in the head portion of the ink catcher so that ink from the print head will pass into the ink catcher and be held therein if there is no document in the sheet path between the print head and the ink catcher at the time ink is expelled therefrom.

In the exemplary embodiment after a new ink cartridge has been installed, a servicer may test the operation of the printer. This is accomplished by providing appropriate inputs to the machine. A servicer moves a sheet into the sheet path. This may be done in some cases manually and in other cases by providing and moving a sheet in the sheet path through one or more transports. One or more inputs from the servicer to input

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devices of the machine cause the processor to operate the printer to expel ink from the print head toward the sheet path. If the sheet is present ink impacts the sheet to print thereon. In some cases the processor operates the print head to print an appropriate pattern such as one that tests that all the nozzles are working. In other embodiments other indicia may be printed. Of course if no sheet is present in the sheet path, the ink from the print head passes into the body of the ink catcher through the opening in the head portion. Of course this approach is exemplary, and in other embodiments other approaches and processes may be used.

In some embodiments after printing is conducted the machine may operate to wipe the nozzles of the print head. This may be done in response to the programming associated with the processor and/or in response to an input from a servicer. In such a situation the drive operates to rotate the head portion 588 about the projecting portion 584 so that the flexible wiper member engages the print head. In the exemplary embodiment the wiper member wipes across the print head as the head portion of the ink catcher makes about one rotation from its initial position. The head portion rotates responsive to the drive until the head portion is again sensed as having the opening therein aligned with the print head. This is sensed by the sensor 606 sensing the rotational position of the disk member 604. In response to sensing that one head portion is in the position for capturing ink from the print head, the processor is operative to cause the drive to cease operation. Of course these approaches are exemplary and in other embodiments other approaches may be used.

In an exemplary embodiment when the ink catching mechanism has become filled with ink it is possible to replace the body by disengaging one or more fasteners that hold it in position and install a new one in the operative position. Alternatively in some embodiments the body may be opened and the ink absorbing member 600 removed and replaced with a new member.

In the exemplary embodiment the body is disengaged from the machine by disengaging the one or more fasteners or other devices that hold the mounting portion 601 to the adjacent housing structure of the document accepting device. Once this is done, the body 580 is moved so that the projecting portion 584 no longer extends within the interior area of the movable head portion 588. Once this is done, the body can be discarded. Alternatively, the body may be opened, the ink absorbing member 600 removed, a new ink absorbing member installed and the body again closed.

A new body or one with a new ink absorbing member is installed by extending the projection portion 584 thereof within the interior area of the head portion 588. The body is then fastened in place through the mounting portion. In response to appropriate inputs to an input device of the machine from a servicer, the processor operates to cause the drive 602 to rotate the head portion 588. The processor may operate in accordance with its programming to rotate the head portion 588 only as necessary to align the opening 592 with the print head. Alternatively the processor may operate the drive to make one or more rotations before stopping the rotation of the head portion. In some embodiments the processor may operate the printer to test its operation as previously discussed, and may then rotate the head portion to wipe the nozzles of the print head. Of course these approaches are exemplary and in other embodiments other approaches may be used.

Thus as can be appreciated the exemplary embodiment of the ink catching mechanism provides an effective way for the printer to be operated so as to avoid the deposition of excess

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ink within the ATM as well as to enable the print nozzles to be maintained in a suitable operating condition so that printing may be reliably conducted.

In the exemplary embodiment documents such as checks are moved into the storage area 430 through the vertical transport 556. Such documents are held initially between the rails 562 of the guide 564 and the belt flights 560 of the vertical transport. In the exemplary embodiment such documents may be selectively stored in one of two available sections (alternatively referred to herein as locations) of the storage area. These include a first storage location 608 positioned on a first side of the vertical transport and a second storage location 610 positioned on an opposed transverse side of the vertical transport. Selective positioning of documents into the storage locations is accomplished through use of a movable plunger member 612 which operates responsive to one or more processors to disengage documents from the vertical transport and move the documents into either the first storage location or second storage location of the storage area.

FIGS. 31 through 35 show the operation of the exemplary plunger member to move a document 614 into storage location 608. As shown in FIG. 32 when the document 614 has moved downward into the storage area, the plunger 612 has been positioned to the right of the document as shown in storage location 610. In the exemplary embodiment movement of the plunger member is accomplished through use of a suitable drive and movement mechanism such as a rack drive, worm drive, tape drive or other suitable movement device. Such a drive is represented schematically by drive 616 in FIG. 3.

Once the document has been moved to the proper position and the vertical transport is stopped, the plunger 612 moves from the position shown in FIG. 32 to the left so as to engage the document. Such engagement with the document deforms the contour of the document as shown and begins to pull the document transversely away from engagement with the belt flights and the guide rails or other document moving structures. A spring biased backing plate 618 which may have additional documents in supporting connection therewith, is moved by the action of the plunger as shown in FIGS. 33 and 34. Backing plate 618 is biased by a spring or other suitable device so that documents in supporting connection with the backing plate are generally trapped between the backing plate and the wall surfaces 574 of the guide.

As represented in FIGS. 34 and 35 as the plunger 612 moved further toward the storage location 608, the document disengages from the rails and belts so that the document is eventually held in supported relation with the backing plate 618 by the plunger. Once the document 614 has reached this position as shown in FIG. 35 the plunger may be moved again to the right as shown such that the document 614 is integrated into the document stack supported on backing plate 618. Further as the plunger 612 returns toward its original position, the documents supported on the backing plate are held in sandwiched relation between the wall surfaces 574 of the guide and the backing plate. Thus the document 614 which was moved into the storage area has been selectively moved through operation of the plunger into the storage location 608.

FIGS. 36 through 40 show operation of the plunger member to store a document in storage location 610. As shown in FIG. 37 a document 620 is moved into the vertical transport and because this document is to be stored in storage location 610 the plunger member 612 is positioned responsive to operation of the processor to the left of the document as shown. As shown in FIGS. 38 and 39 movement of the plunger member 612 toward the right as shown disengages

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the document from the transport and brings it into supporting connection with a spring loaded backing plate 622. Backing plate 622 is biased by a spring or other suitable biasing mechanism toward the left as shown in FIGS. 39 and 40.

Movement of the plunger 612 to the extent shown in FIG. 40 causes the document 620 to be supported in a stack on the backing plate 622. In this position the plunger may be again moved to the left such that the documents in the stack in storage location 610 are held in sandwiched relation between the back walls 572 of the vertical transport and the backing plate.

As can be appreciated in the exemplary embodiment documents can be selectively stored in a storage location of the device by positioning and moving the plunger so that the document is stored in the storage location as desired. This enables documents to be segregated into various document types. For example in some embodiments the ATM may be operated such that checks that are drawn on the particular institution operating the machine are stored in one storage

location of the storage area 430 while others that are not drawn on that institution are stored in the other storage location. Alternatively in some embodiments where the mechanism is used to accept checks and currency bills, bills which have been validated may be stored in one storage location while bills that have been determined to be counterfeit or suspect may be stored in another storage section. In still further alternative embodiments where the device is operated to accept checks and bills, currency bills may be stored in one storage location while checks are stored in another. Of course this approach is exemplary.

In alternative embodiments additional provisions may be made. For example in some embodiments one or more aligned vertical transports may be capable of transporting documents through several vertically aligned storage areas.

In such situations a document may be moved to the vertical level associated with a storage area that is appropriate for the storage of the document. Once at that level a plunger may move transversely so as to place the document into the appropriate storage location on either side of the vertical transport. In this way numerous types of documents can be accepted and segregated within the ATM.

In still other alternative embodiments the storage mechanism may be integrated with a document picker mechanism such as shown in U.S. Pat. No. 6,331,000 the disclosure of which is incorporated by reference. Thus documents which have been stored such as currency bills may thereafter be automatically removed through operation of the picker mechanism and dispensed to users of the ATM machine. Various approaches may be taken utilizing the principals of the described embodiments.

As shown in FIG. 2 exemplary storage area 440 is generally held in a closed position such that the items stored therein are not accessible even to a servicer who has access to the interior of the ATM. This is accomplished through use of a sliding door 624 which in the exemplary embodiment is constructed of collapsible sections. The door is enabled to be moved such that access to documents stored in the storage area can be accessed such as is shown in FIG. 28. In an exemplary embodiment the ability to open door 624 is controlled by a lock 626. In the exemplary embodiment lock 626 comprises a key lock such that authorized persons may gain access to the interior of the storage area if they possess an appropriate key.

In some exemplary embodiments the deposit accepting device may be mounted in movable supporting connection with structures in the interior of the housing of the banking machine. This may be done in the manner shown in U.S. Pat. No. 6,010,065 the disclosure of which is incorporated herein

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by reference. In some exemplary embodiments a servicer may access the interior of the banking machine housing by opening one or more external doors. Such doors may require the opening of one or more locks before the interior of the housing may be accessed. With such a door open the servicer may move the deposit accepting device 420 while supported by the housing so that the storage area of the device extends outside the housing. This may make it easier in some embodiments to remove documents from the storage area.

In the exemplary embodiment persons authorized to remove documents from the storage area may open the lock and move the door 624 to an open position so as to gain access to the interior of the storage area. Documents that have been positioned in the storage locations can be removed by moving the backing plates 622 and 618 against the spring biasing force of the respective springs or other biasing mechanisms 617, 619, that holds the stacks of stored documents in sandwiched relation. Manually engageable tabs 628 and 630 are provided in the exemplary embodiment so as to facilitate the servicer's ability to move the backing plates against the respective biasing force. With the respective backing plate moved horizontally away from the vertical transport, the stack of documents between the backing plate and vertical transport can be removed. Each backing plate can be moved to remove document stacks on each horizontal side of the vertical transport. Once the stored documents have been removed, the backing plates can return automatically to the appropriate position to accept more documents due to the biasing force. Likewise the door 624 can be closed and the lock returned to the locked position. If the deposit accepting device is movably mounted so that the storage area is outside the machine, it can be moved back into the interior of the housing. The housing can then be secured by closing the doors and locks thereon. This construction of the exemplary embodiment not only facilitates the removal of checks, currency or other documents, but is also helpful in clearing any jams that may occur within the vertical transport.

The exemplary embodiment also provides advantages in terms of clearing jams within the document alignment, analysis and/or escrow areas. For example as shown in FIGS. 1 and 2, the device may be opened such that the entire transport path for documents up to the point of the vertical transport may be readily accessed. As a result in the event that the document should become jammed therein, a servicer may unlatch a latch which holds a platen in position such as for example latch 632 shown in FIG. 1 and move the platen 448 rotationally and the components supported thereon to the position shown so as to enable exposing the document alignment area and document analysis area. As can be appreciated platen 448 is mounted through hinges which enable the platen to rotate about an axis through the hinges so as to facilitate the opening thereof. Likewise the portions of the platen 449 supporting the mechanisms overlying the escrow area can be opened as shown to expose that area of the document transport path so as to facilitate accessing documents therein. As shown in FIGS. 1 and 2, platen 449 is rotatable about an axis that extends generally perpendicular to the axis about which platen 448 is rotatable. Further in the exemplary embodiment, platens 448 and 449 are configured so that platen 448 must be moved to the open position before platen 449 can be opened. Likewise platen 449 must be closed before platen 448 is closed. This exemplary construction enables the use of a single latch to secure the platens in the operative positions, and to enable unsecuring the single latch so that the platens can both be moved to expose the document alignment, document analysis and escrow areas of the document transport path in the device.

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Of course, this approach is exemplary and in other embodiments other approaches may be used.

In servicing the exemplary embodiment of the deposit accepting device 420 which for purposes of this service discussion will be described with regard to checks, a servicer generally begins by opening a door or other access mechanism such as a fascia or panel that enables gaining access to an interior area of the housing of the ATM. In an exemplary embodiment the check accepting device 420 is supported on slides, and after unlatching a mechanism that normally holds the device in operative position, the device can be moved, while supported by the housing to extend outside the ATM. Of course in some situations and depending on the type of service to be performed, it may not be necessary to extend the device outside the ATM housing. Alternatively in some situations a servicer may extend the device outside the housing and then remove the device from supporting connection with the ATM housing completely. This may be done for example, when the entire device is to be replaced with a different device.

The servicer may disengage the latch 632 and rotate platen 448 about the axis of its hinges. This exposes the areas of the transport path through the device in the document alignment area 424 and document analysis area 426. It should be noted that when the platen 448 is moved to the open position the toothed contoured edges 456, 458 shown in FIG. 4, are moved apart.

With the platen 448 moved to expose the document alignment and document analysis areas, any checks which have become caught or jammed therein can be removed by the servicer. The servicer can also conduct other activities such as cleaning the scanning sensors or the magnetic read head. Such cleaning may be done using suitable solvents, swabs or other materials. The servicer may also clean, align, repair or replace other items in the exposed areas of the transport path.

With platen 448 in the open position a servicer may also move platen 449 from the closed position to the open position shown in FIGS. 2 and 3. Rotating platen 449 about the axis of its supports to the open position, exposes the escrow area 428 of the transport path. A servicer may then clear any jammed documents from the escrow area. The servicer may also clean, align, repair or replace other components that are exposed or otherwise accessible in the escrow area.

Upon completion of service the platen 449 is rotated to the closed position. Thereafter the platen 448 is rotated to the closed position. This brings the contoured edges 456, 458 back into adjacent alignment. With platen 448 in the closed position the latch 632 is secured to hold both platens in the closed positions, the check accepting device can then be moved back into the operating position and secured therein. The servicer when done, will then close the door or other device to close the interior of the ATM housing. Of course these approaches are exemplary.

Upon closing the housing the ATM may be returned to service. This may include passing a test document through the transport path through the deposit accepting device 420 and/or reading indicia of various types from one or more test documents. It may also include operating the machine to image the document that was jammed in the device to capture the data therefrom so that the transaction that caused the ATM malfunction can be settled by the system. Of course it should be understood that these approaches are exemplary and in other embodiments other approaches may be used.

FIG. 41 shows an alternative exemplary embodiment of an automated banking machine 640. Banking machine 640 includes a housing 642. Housing 642 of the machine includes a chest portion 644 and an upper housing portion 646. Chest

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portion **644** provides a secure storage area in an interior portion thereof. The interior of the chest portion may be used for example to store valuable sheets such as currency notes, travelers checks, scrip, checks, tickets or other valuable sheets that have been received by and/or that are to be dispensed from the machine. The chest portion includes a suitable chest door and lock for providing authorized access thereto. The upper housing portion **646** of the exemplary embodiment also includes suitable access doors or other mechanisms to enable authorized persons to obtain access to items therein. Examples of chest portions are shown in U.S. Pat. No. 7,000,830 and U.S. Application No. 60/519,079, the disclosures of which are incorporated herein by reference.

The exemplary automated banking machine **640** includes output devices including a display **648**. Other output devices may include for example speakers, touchpads, touchscreens or other items that can provide user receivable outputs. The outputs may include outputs of various types including for example, instructions related to operation of the machine. The exemplary automated banking machine further includes input devices. These may include for example a card reader **650**. The card reader may be operative to read indicia included on cards that are associated with a user and/or a user's account. Card readers may be operative to read indicia for example, indicia encoded on a magnetic stripe, data stored in an electronic memory on the card, radiation transmitted from an item on the card such as a radio frequency identification (RFID) chip or other suitable indicia. User cards represent one of a plurality of types of data bearing records that may be used in connection with activating the operation of exemplary machines. In other embodiments other types of data bearing records such as cards, tokens, tags, sheets or other types of devices that include data that is readable therefrom, may be used.

In exemplary embodiments data is read from a card through operation of a card reader. The card reader may include features such as those disclosed in U.S. Pat. No. 7,118,031 the disclosure of which is incorporated herein by reference. The exemplary automated banking machine is operative responsive to at least one processor in the machine to use data read from the card to activate or allow operation of the machine by authorized users so as to enable such users to carry out at least one transaction. For example the machine may operate to cause data read from the card and/or data resolved from card data and other inputs or data from the machine, to be compared to data corresponding to authorized users. This may be done for example by comparing data including data read from the card to data stored in or resolved from data stored in at least one data store in the machine. Alternatively or in addition, the automated banking machine may operate to send one or more messages including data read from the card or data resolved therefrom, to a remote computer. The remote computer may operate to cause the data received from the machine to be compared to data corresponding to authorized users based on data stored in connection with one or more remote computers. In response to the positive determination that the user presenting the card is an authorized user, one or more messages may be sent from the remote computer to the automated banking machine so as to enable operation of features thereof. This may be accomplished in some exemplary embodiments through features such as those described in U.S. Pat. Nos. 7,284,695 and/or 7,266,526 the disclosures of each of which are incorporated herein by reference. Of course these approaches are exemplary and in other embodiments other approaches may be used.

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The exemplary automated banking machine further includes a keypad **652**. Keypad **652** provides a user input device which includes a plurality of keys that are selectively actuatable by a user. Keypad **652** may be used in exemplary embodiments to enable a user to provide a personal identification number (PIN). The PIN data may be used to identify authorized users of the machine in conjunction with data read from cards so as to assure that machine operation is only carried out for authorized users. Of course the input devices discussed herein are exemplary of numerous types of input devices that may be used in connection with automated banking machines.

The exemplary automated banking machine further includes other transaction function devices. These may include for example, a printer **654**. In the exemplary embodiment **654** is operative to print receipts for transactions conducted by users of the machine. Other embodiments of automated banking machines may include other types of printing devices such as those suitable for printing statements, tickets or other types of documents. The exemplary automated banking machine further includes a plurality of other devices. These may include for example, a sheet dispensing device **656**. Such a device may be operative to serve as part of a cash dispenser device which selectively dispenses sheets such as currency notes from storage. It should be understood that for purposes of this disclosure, a cash dispenser device, is one or more devices that can operate to cause currency stored in the machine to be dispensed from the machine. Other devices may include a recycling device **658**. The recycling device may be operative to receive sheets into a storage location and then to selectively dispense sheets therefrom. The recycling device may be of a type shown in U.S. Pat. Nos. 6,302,393 and 6,131,809, the disclosures of which are incorporated herein by reference. It should be understood that a recycling device may operate to recycle currency notes and may in some embodiments, a cash dispenser may include the recycler device. Further the exemplary embodiment may include sheet storage devices **660** of the type previously described herein which are operative to selectively store sheets in compartments.

The exemplary ATM **640** includes a deposit accepting device **662** which is described in greater detail hereafter. The deposit accepting device of an exemplary embodiment is operative to receive and analyze sheets received from a machine user. The exemplary deposit accepting device is also operative to deliver sheets from the machine to machine users. It should be understood that in other embodiments additional or different deposit accepting devices may be used. Further for purposes of this disclosure a deposit accepting device may alternatively be referred to as a sheet processing device.

The exemplary automated banking machine **640** further includes at least one processor schematically indicated **664**. The at least one processor is in operative connection with at least one data store schematically indicated **666**. The processor and data store are operative to execute instructions which control and cause the operation of the automated banking machine. It should be understood that although one processor and data store are shown, embodiments of automated banking machines may include a plurality of processors and data stores which operate to control and cause operation of the devices of the machine.

The at least one processor **664** is shown in operative connection with numerous transaction function devices schematically indicated **668**. Transaction function devices include devices in the machine that the at least one processor is operative to cause to operate. These may include devices of

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the type previously discussed such as the card reader, printer, keypad, deposit accepting device, sheet dispenser, recycler and other devices in or that are a part of the machine.

In the exemplary embodiment the at least one processor is also in operative connection with at least one communication device **670**. The at least one communication device is operative to enable the automated banking machine to communicate with one or more remote servers **672, 674** through at least one network **676**. It should be understood that the at least one communication device **670** may include various types of network interfaces suitable for communication through one or more types of public and/or private networks so as to enable the automated banking machine to communicate with a server and to enable ATM users to carry out transactions. Of course it should be understood that this automated banking machine is exemplary and that automated banking machines may have numerous other types of configurations and capabilities.

FIG. 42 shows in greater detail the exemplary deposit accepting device **662**. The exemplary deposit accepting device is in operative connection with a sheet opening **678** that extends through the housing of the machine. In the exemplary embodiment the sheet opening is configured to enable the sheets to be provided thereto into the machine from users, as well as to deliver sheets from the machine to users. Access through the sheet opening is controlled in the exemplary embodiment by a movable gate **680**. Gate **680** is selectively moved between the opened and closed positions by a drive **682**. The drive **682** selectively opens and closes the gate responsive to operation of the at least one processor **664**. Therefore in operation of the exemplary automated banking machine the gate is moved to the open position at appropriate times during transactions such as when sheets are to be received into the machine from users and when sheets are to be delivered from the machine to users.

The exemplary device further includes a sheet access area generally indicated **684**. The exemplary sheet access area is an area in which sheets are received in as well as delivered from the machine. The exemplary sheet access area includes a first sheet driver member **686**. The exemplary sheet driver member **686** includes a belt flight of a continuous belt that is selectively driven by a drive (not separately shown). The drive operates responsive to operation of the at least one processor. The sheet access area is further bounded upwardly by a sheet driver member **688** which in the exemplary embodiment also comprises a belt flight of a continuous belt. In the exemplary embodiment the lower belt flight which comprises the sheet driver member **688** is vertically movable relative to the upper belt flight which comprises sheet driver member **686** such that a distance between them may be selectively varied. It should be understood however that although the exemplary embodiment uses belt flights as the sheet driver members, in other embodiments rollers, tracks, compressed air jets or other devices suitable for engaging and moving sheets may be used. In the exemplary embodiment a single upper belt flight and lower belt flight are used to move sheets in the sheet access area. However, it should be understood that in other embodiments other numbers and configurations of sheet driving members may be used.

The exemplary sheet access area includes a divider plate **690**. The exemplary divider plate comprises a pair of divider plate portions with an opening thereinbetween. The opening extends parallel to the belt flights and enables the belt flights to engage sheets therethrough. Of course this approach is exemplary. The exemplary divider plate divides the sheet access area into a first side **692** which is below the plate in the exemplary embodiment, and a second side **694** which is

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above the divider plate. It should be understood that although in the exemplary embodiment only one split divider plate is used, in other embodiments a plurality of divider plates may be employed so as to divide an area into multiple subcompartments.

In the exemplary embodiment the divider plate **690** and upper sheet driving member **688** are selectively relatively movable vertically with respect to the lower sheet driving member **686**. This is done in a manner later explained so as to selectively enable the sheet driving members to engage and move sheets in either the first side or the second side. This is done through operation of drives schematically indicated **696**. Such drives can include suitable motor, levers, solenoids, lead screws and other suitable structures to impart the movement described herein. The drives operate responsive to instructions executed by the at least one processor. It should further be understood that although in the exemplary embodiment the lower sheet driving member is generally in fixed vertical position relative to the housing, in other embodiments the lower sheet driving member may be movable and other components may be fixed.

In the exemplary embodiment the sheet access area further includes a movable stop **698**. The stop is operative to extend at appropriate times to limit the inward insertion of documents into the sheet access area by a user. The stop operates to generally positively position inserted sheets that are going to be received and processed by the deposit accepting device. The stop is selectively movable by at least one drive (not separately shown) which moves the stop in response to operation of the at least one processor. The inner ends of sheet driver members **686** and **688** bound an opening **699** through which sheets can move either inwardly or outwardly in the deposit accepting device **662**.

The exemplary sheet access area is operatively connected to a picker **700**. The picker is operative to separate individual sheets from a stack in the sheet access area. In the exemplary embodiment the picker may operate in a manner like that described in U.S. Pat. Nos. 6,634,636; 6,874,682; and/or 7,261,236 the disclosures of which are incorporated herein by reference. The picker operates generally to separate each sheet from the inserted stack of sheets. At least one sensor **702** operates in the exemplary embodiment to sense thickness and enable at least one processor to determine if the picker has failed to properly separate each individual sheet. In response to sensing of a double or other multiple sheet in the area beyond the picker, the at least one processor operates in accordance with its programming to reverse the picking function so as to return the sensed multiple sheets to the stack. Thereafter the picker may attempt to pick a single sheet and may make repeated attempts until a single sheet is successfully picked. Further as later explained, in the exemplary embodiment the picker is operative to pick sheets that may be located in either the first side **692** or the second side **694** of the divider plate in the sheet access area.

In the exemplary embodiment the picker **700** is operative to deliver individual sheets that have been separated from the stack to a sheet path indicated **704**. Sheets are moved in the sheet path through operation of a transport **706** which engages the sheets. It should be understood that although a single transport of a belt type is shown, in other embodiments other numbers and types of transports may be employed for moving sheets.

In the exemplary embodiment the area of the sheet path includes a document alignment area which may operate in the manner similar to that previously described or in other suitable ways, to align sheets relative to the direction that sheets are moved along the transport path. For example in the exem-

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plary embodiment the transverse transport includes transverse transport rolls 710 that operate in a manner like that previously discussed to engage a sheet and move it into alignment with the transport path by sensing an edge of the sheet with a plurality of spaced sensors which form a "virtual wall." The transverse movement of the sheet by the transverse transport is operative to align the sheet relative to the movement of sheets along sheet path in the device. As discussed in more detail below, in this exemplary embodiment the alignment area includes devices operative to align the sheet as well as to determine a width dimension associated with the sheet so as to facilitate the analysis of magnetic indicia thereon.

In some embodiments it may be desirable to use sheet transports that move sheets in sandwiched relation between a driving member such as a roll or belt flight, and a follower member that extends on an opposed side of the sheet from the driving member. The follower member may be operative to assure engagement of the sheet with the driving member to assure sheet movement therewith. In some embodiments movable rolls or belts may operate as suitable follower members. However, in some embodiments it may be desirable to use stationary resilient members as biasing members. This may include, for example, a resilient member with a low friction sheet engaging surface to facilitate sheet movement thereon. For example such a suitable member may comprise a compressible resilient foam body with a low friction plastic cover. Such a foam member can be used to provide biasing force to achieve sheet engagement with a driving member. In still other embodiments the foam body may be operatively supported on a further resilient member, such a leaf spring which can provide a further biasing force. Such a structure for a follower member may be useful in sheet transports in providing more uniform force distribution on moving sheets to minimize the risk of sheet damage. Further such a sheet follower structure may be useful in providing the follower function for one or more transports that move sheets in multiple directions, at least some of which are transverse to one another in a particular sheet transport area. As a result such follower structures may be used in the area in which sheets are aligned. Of course this approach is exemplary.

In the exemplary embodiment the transport 706 is operative to move sheets to engage a further transport schematically indicated 712. The transport is also operative to move sheets past magnetic indicia reading devices 714, 716 which are alternatively referred to herein as magnetic read heads. The exemplary embodiment further includes analysis devices for analyzing documents. These include for example, an imager 718. Imager 718 may be of the type previously discussed that is operative to generate data corresponding to the visual image of each side of the sheet. Further in the exemplary embodiment an analysis device includes a currency validator 720 is used to analyze properties of notes. For example in some embodiments currency validators employing the principles described in U.S. Pat. No. 5,923,413 which is incorporated herein by reference may be used for purposes of determining whether sheets have one or more property associated with valid notes. The at least one processor may be operative to determine whether notes received are likely valid, invalid and/or of suspect authenticity. Other devices may be included which sense for other properties or data which can be used to analyze sheets for properties that are associated with authenticity. Based on determining whether sheets have at least one property, the exemplary automated banking machine is operative to store, return or otherwise process notes in a manner that is later described. Of course it should be understood that some of the principles may be used by the at least one processor to make a determination if at least

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one property associated with checks analyzed through devices in the machine, have one or more properties that suggest that they are valid or invalid checks. Similarly analysis devices in a machine may be used to assess validity of other types of sheets.

In the exemplary embodiment the deposit accepting device includes a sheet storage and retrieval device 722. In the exemplary embodiment the sheet storage and retrieval device includes a belt recycler. The belt recycler may be of the type shown in U.S. Pat. No. 6,270,010 the disclosure of which is incorporated herein by reference. The sheet storage and retrieval device is selectively operative to store sheets that are directed thereto from the transport 712 by a diverter 724. The diverter is selectively operated responsive to a drive which moves responsive to instructions from the at least one processor to cause sheets to be directed for storage in the sheet storage and retrieval device 722.

In the exemplary embodiment the sheet accepting device further includes a sheet storage and retrieval device 726. The sheet storage and retrieval device 726 of the exemplary embodiment may be similar to device 722. Sheets are directed to the sheet storage and retrieval device 726 from the transport 712 through selective operation of a diverter 728. It should be understood that although in the exemplary embodiment the sheet storage and retrieval devices include belt recyclers, other forms of devices that are operative to accept and deliver sheets may be used.

In exemplary embodiments the transports 712 and 706 are selectively operated responsive to respective drives. The drives operate responsive to operation of the at least one processor to move sheets therein. The transports of the exemplary embodiment are operative to move sheets both away from and toward the sheet access area. Further in the exemplary embodiment a diverter 730 is positioned adjacent to the sheet access area. The diverter 730 operates in the manner later described to direct sheets moving toward the sheet access area onto the second side of the diverter plate. Of course this approach is exemplary.

Further in the exemplary embodiment the automated banking machine includes a plurality of transports as shown, which enable sheets to be selectively moved to and from the storage area 660, the sheet dispenser device 656, the recycling device 658 and other devices or areas, to or from which sheets may be delivered and/or received. Further in the exemplary embodiment appropriate gates, diverters and/or other devices may be positioned adjacent to the transports so as to selectively control the movement of sheets as desired within the machine. It should be understood that the configuration shown is exemplary and in other embodiments other approaches may be used.

FIG. 43 shows an alternative exemplary embodiment of a document alignment area 708. The document alignment area includes a platen 732. The platen includes a plurality of document alignment sensors 734. The document alignment sensors 734 are similar to alignment sensors 474 previously discussed. As with the prior embodiment three document alignment sensors extend in spaced relation along the direction of sheet movement in the transport path. A plurality of rollers 736 operate in a manner similar to rollers 444 and are operative to move the sheet in the direction of the transport path. A transverse transport that is operative to move sheets in a direction generally perpendicular to the transport path includes transverse follower rolls 738. As in the case with the prior described embodiment, the transverse transport includes transverse rolls on an opposed side of the transport from the platen 732. As in the previously described embodiment the rollers 736 generally engage a sheet between the

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rollers and other driving members such as a belt. To align the sheet, the rollers 736 move away from the sheet and the transverse follower rolls 738 that were previously disposed away from the sheet move toward the sheet to engage the sheet in sandwiched relation between the transverse transport roll and a corresponding follower roll. The sheet is moved transversely until it is aligned with the direction of movement of sheets in the transport path based on the document alignment sensors 734. This is done in a manner like that previously discussed. The transverse transport rollers are then moved to disengage the sheet while the rollers 736 move to engage the sheet so that it now can be moved in its aligned condition in the transport path. Of course instead of rollers other types of sheet moving members may be used.

The exemplary deposit accepting device includes magnetic read heads 714 and 716. Magnetic read head 714 may be mounted in a manner like that previously discussed. In the exemplary embodiment, magnetic read head 714 is in a fixed transverse position relative to the sheet path. Magnetic read head 714 is generally positioned in the exemplary embodiment relative to the sheet path so that a check that has been aligned in the document alignment area will generally have the micr line indicia on the check pass adjacent to the magnetic read head 714. This is true for two of the four possible facing positions of a check as it passes through the device. This is represented by the exemplary check segments 740 and 742 shown in FIG. 44.

Magnetic read head 716 is mounted in operatively supported connection with a mount 744. Mount 744 is movable transversely to the sheet path as represented by arrow M in FIG. 45. The position of read head 716 transversely relative to the sheet path is changeable through operation of a positioning device 746. The positioning device may include any number of movement devices such as a motor, solenoid, cylinder, shape memory alloy element or other suitable element that is operative to selectively position read head 716 relative to the sheet path.

As can be appreciated from FIG. 44, read head 716 may be selectively positioned transversely so that when a check is in the two orientations where the micr line data would not pass adjacent to read head 714, such micr line indicia would pass adjacent to read head 716. This is represented by exemplary check segments 748 and 750 in FIG. 44.

In the exemplary embodiment the document alignment area includes a width sensor 752. Width sensor 752 may include in some embodiments a plurality of aligned sensors, a linear array charge couple device (CCD) sensors or other sensor or groups of sensors that are operative to sense at least one dimension or property which corresponds to a width associated with a check. In the exemplary embodiment this is done once the check has been aligned with the transport path and the document alignment sensors 734. This capability of determining using signals from the sensor 752, the width of the aligned document enables at least one processor in the machine to cause the positioning device 746 to move the read head 716 to the appropriate transverse position for reading the micr line indicia on the check in the event that the check is in one of the two positions wherein the micr indicia is disposed on the opposite of the check from read head 714.

The at least one processor has associated programming in at least one data store that enables determination of the proper position for the read head 716 because check printing standards specify the location of the micr line indicia relative to a longitudinal edge of the check. As a result for a given check that has been aligned in the document alignment area, the at least one processor is operative to determine a width associated with the check responsive to signals from sensor 752.

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The width signals thereafter enable the processor to cause the read head 716 to be positioned in an appropriate transverse position for reading the micr data if the check is in two of the four possible check orientations.

It should be noted that as represented in FIG. 44 the read heads are operative to read the micr indicia regardless of whether the indicia is on the check immediately adjacent to the read head or on an opposed side of the check from the read head. This is because the magnetic characters which comprise the micr indicia can be sensed through the paper. Further in the exemplary embodiment the magnetic read heads are positioned in a curved area of the transport path. This generally helps to assure in the exemplary embodiment that the check is in contact or at least very close proximity with the read head.

Further the exemplary embodiment of the mount 744 includes a plurality of vanes 754. Vanes 754 are curved and are operative to help guide the sheet through the area of the magnetic read heads without snagging. In an exemplary embodiment the vanes 754 are operative to reduce surface tension so as to facilitate movement of sheets thereon. Of course it should be understood that these structures are exemplary and in other embodiments other approaches may be used.

In an exemplary embodiment at least one processor of the automated banking machine has associated programming that enables decoding the micr line data regardless of the facing position of the check as it is moved past the magnetic read heads. As can be appreciated depending on the facing position of the check the micr data may be moving in any of the forward direction or the backward direction and right side up or upside down as it passes in proximity to the one adjacent magnetic read head. Signals are generated by the magnetic read head responsive to the magnetic indicia which makes up the micr line data. The programming of the at least one processor is operative to receive and record these signals, and to determine the micr line characters that correspond thereto. In the exemplary embodiment this includes comparing the data for at least some of the characters that correspond to the micr line, to data corresponding to one or more micr line characters so that it can be determined the orientation in which the micr line data has been read. The at least one processor may operate in accordance with its programming to conduct pattern matching of the sensed signals to signals corresponding to known micr characters to determine the probable micr characters to which the signals correspond. This may be done for one or multiple characters to determine a probable orientation of the check data. This probable orientation may then be checked by comparing the data as read from the magnetic read head, to other data which corresponds to the micr data initially determined orientation. If the orientation corresponds to an appropriate micr line character then it is probable that the orientation has been properly determined. If however the sensed data does not correspond appropriately to characters in the initially determined orientation, then it is probable that the orientation determined is incorrect. In some embodiments the at least one processor may operate to compare signals corresponding to the magnetic indicia read from the check to data corresponding to micr line characters in multiple possible orientations. The results may then be compared to determine the number of unidentifiable characters in each of the orientations. Generally in at least one orientation which corresponds to the actual orientation of the check, the at least one processor will determine that all of the characters correspond to identifiable micr line characters.

In still other embodiments character recognition analysis software routines may be operative to identify micr line characters in each of the possible orientations which a degree of confidence. This degree of confidence would hopefully be

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much higher for one particular orientation which then indicates the facing position of the check as well as the micr line characters to which the data corresponds. In still other alternative embodiments other approaches may be used to determine the facing position of the check. This may include for example analysis of optical features to determine that the check is in a particular orientation. The information on a facing position as determined from optical features may then be used to analyze or, as a factor in the analysis, of the magnetic indicia on the check as carried out by at least one processor.

Of course it should be understood that while the discussion of the exemplary embodiment has included a discussion of micr line data associated with a check, in other embodiments other types of magnetic indicia may be analyzed and used. Further it should be understood that checks and other items which include magnetic indicia thereon serve as coded records on which magnetic data is encoded. Alternative approaches may also be used in other embodiments for reading of magnetic recoded indicia on such records, and the magnetic read heads described in connection with this particular embodiment are exemplary. Further it should be understood that while the coded records in the form of checks have the micr line data offset from the center line of the record and generally in a defined location relative to one or more edges of the document, other embodiments may operate to have magnetic indicia in other locations. Further some exemplary embodiments may also include provisions for sensing magnetic indicia on records in various locations and determining the nature of such indicia in various locations based on signals produced from sensing the record. Of course these approaches are exemplary and in other embodiments other approaches may be used.

The operation of an exemplary embodiment is now explained with reference to FIGS. 46 through 67. The exemplary automated banking machine is operated by a customer to perform at least one transaction involving acceptance of sheets. This may include for example, the user providing inputs to identify themselves or their account, as well as to indicate a transaction that they wish to conduct through operation of the machine. This may be done in response to instructions output through the display. The user indicates that they wish to conduct a sheet accepting transaction. The sheet accepting transaction may include in some embodiments, acceptance of checks, and other embodiments the sheets to be accepted may include notes. In still other embodiments the sheets to be accepted may include mixed notes from checks. In still other embodiments other types of sheets or items may be accepted depending on the capabilities of the machine.

With reference to FIG. 46, in the conduct of an exemplary transaction the sheet access area 684 initially has external access thereto blocked by the gate 680. The user prepares a stack 756 comprising a plurality of sheets for receipt by the machine through the sheet opening 678. It should be noted that in the initial position the divider plate 690 and the belt flight 688 are disposed downward and are in generally supporting connection with the belt flight 686. Of course it should be appreciated that as shown in FIGS. 46 through 67, the structures in the sheet acceptance area are shown in a sectional view taken through the middle of the sheet acceptance area.

Responsive to the at least one processor in the machine operating to cause the machine to carry out a sheet accepting transaction, the at least one processor is operative to cause the gate 680 to open as shown in FIG. 48. The at least one processor is also operative to cause the stop 698 to move to a

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raised position. The processor is also operative to cause the divider plate and upper transport including the upper sheet driver member, to be disposed a greater distance away from the belt flight 686. This enables the user to insert the stack 756 inwardly into the area between the belt flight 768 and the divider plate 690, until the stack is in abutting relation with the stop. As shown in FIGS. 50 and 51 the at least one processor is thereafter operative to retract the stop 698 and to cause the belt flight 688 and divider plate 690 to be lowered. This provides for the stack 756 to be in sandwiched relation between the belt flight 686, belt flight 688 and divider plate 690. It should be remembered that the exemplary divider plate includes a pair of horizontally disposed plate portions including the central opening that extends parallel to each belt flight belt. This enables each of the belt flights to operatively engage the sheets in the stack. The divider plate is also movably mounted relative to the housing such that each divider plate portion can be moved vertically, responsive to at least one drive, and can also move angularly to maintain engagement with sheets. In the exemplary embodiment each of the portions of the divider plate are enabled to pivot generally about a horizontal axis that extends near the transverse center thereof. In the exemplary embodiment the extent that each portion of the divider plate is enabled to pivot is generally limited to a relatively small angle. This ability of the divider plate to pivot as well as to move vertically generally in the area of the axis about which the portion can pivot, facilitates the exemplary embodiment's capabilities to deliver and receive sheets from users as well as to deliver and receive sheets to and from the opening of the deposit accepting device.

The at least one processor causes at least one drive to move the belt flights so that the stack 756 moves inwardly from the sheet access area such that the ends of the sheet move inwardly past the gate 680. As shown in FIGS. 54 and 53 sensors 758 are positioned to sense the stack in the sheet access area. Responsive to the end of the stack having moved inward between the belt flights, the at least one processor is operative to cause the gate 680 to close as shown in FIGS. 52 and 53. The closing of the gate prevents persons who have deposited a stack of sheets from further accessing such sheets after they have moved in the machine.

As represented in FIGS. 54 and 55 the sheets are moved inwardly through operation of the belt flights so that the sheets move in the opening 699 past the inward end of the divider plate and into contact with the picker 700.

As shown in FIGS. 56 and 57 the processor then operates to cause the upper belt flight 688 to move upwardly and away from the lower belt flight 686. The divider plate 690 remains disposed above and in contact with the stack 756. In this position the leading edge of the stack extends inward in the machine beyond the inward edge of the divider plate and the stack moves adjacent to the picker 700. The picker then operates generally in the manner of the incorporated disclosures to pick sheets one at a time to separate them from the stack.

In the exemplary embodiment the divider plate acts to hold the stack positioned against the driver member 686 and adjacent a registration plate portion 687 to facilitate reliable picking of sheets by the picker. During picking, a thumper member 764 also acts on the bottom sheet in the stack to urge the bottom sheet to move toward the picker. The thumper member 764 moves rotationally responsive to a drive and also provides an upward and inward directed force on the bottom sheet. The downward force applied on the top of the stack by the divider plate increases the effective force applied by the thumper member urging the sheet at the bottom of the stack to move

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toward the picker. Of course this approach is exemplary and in other embodiments other approaches may be used.

In the operation of the exemplary embodiment the deposit accepting device operates in accordance with the programming of the at least one processor, to move the sheets into the document alignment area 708. Each picked sheet is aligned in the manner discussed, and moved in the sheet path past the analysis devices such as the magnetic read heads 714, 716; imager 718; currency validator 720; and/or other sheet analysis devices. Of course it should be understood that in some embodiments other or different sheet analysis devices may be present. For example in a device which only accepts checks, a currency validator and associated sensors may not be present. Likewise depending on the nature of the sheets being accepted, other or additional analysis devices may be included.

In the exemplary embodiment sheets that have been moved past the analysis devices are moved in the transport 712 and are directed through operation of the diverter 724 for storage in the sheet storage and retrieval device 722. In the exemplary embodiment the at least one processor is operative responsive to the signals regarding each sheet from the analysis devices to analyze each sheet for at least one characteristic or property. These may include image properties, magnetic properties, color properties, patterns, watermarks, data or other characteristics that are usable to identify a sheet as an acceptable sheet for acceptance by the machine.

In some embodiments for example, the at least one processor of the machine may operate responsive to data received from the analysis devices to determine that sheets input to the machine include valid currency notes of a given denomination or type. The at least one processor may operate responsive to determining that such valid currency notes have been input to cause the automated banking machine to operate to cause an account associated with the user whose card data was read by a machine to be credited for an amount corresponding to such valid notes. This may be done by the at least one processor causing the automated banking machine to communicate with one or more remote computers that have data stores which include data corresponding to a user's account and the funds allocated thereto. In still other embodiments the at least one processor may operate in the case of received documents which are checks, to determine whether such checks appear to be valid and a user is authorized to be given credit for such checks. This may include for example analyzing the checks in accordance with the incorporated disclosure of U.S. Pat. No. 7,284,695 for example. The automated banking machine may operate using data read from the checks such as the micr line data, image data and/or other data, to cause the automated banking machine to determine that the user of the machine is to be provided value for one or more checks received by the machine. Of course the at least one processor may operate in other embodiments to analyze data read by analysis devices from other types of items which have been received by the machine and make determinations as to whether such items are acceptable and/or whether a user is to be provided with credit therefor.

Further, in some embodiments it should be understood that the at least one processor may also operate to identify certain items as unacceptable to the machine. These may include for example items which cannot be identified as valid currency notes, checks or other items that the machine is programmed to accept. The at least one processor in the machine may operate in accordance with its programming and/or data received by communication with remote computers to determine that the items the user has input cannot be accepted by the machine. Of course these approaches are exemplary.

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In an exemplary embodiment after sheets have been received in the machine the at least one processor is then operative to cause the sheet storage and retrieval device 722 to deliver the sheets one by one to the transport 712. The transport operates to move each of the sheets toward the sheet access area. The diverter 724 is operative to direct the sheets as appropriate toward the sheet access area. As each of the sheets move in the transport 712, the diverter 728 is operative to selectively direct sheets that have been determined to include the at least one property associated with acceptable sheets, to the sheet storage and retrieval device 726. Device 726 is operative to store acceptable sheets while the unacceptable sheets continue in the sheet path toward the sheet access area. In the transport 706 sheets are engaged by the diverter 730 and are directed through the opening 699 onto the second side 794 of the sheet access area. The rejected sheets which are positioned on the second side of the divider plate 690 can be delivered to the machine user in a manner later discussed.

In operation of the exemplary embodiment, the at least one processor is then operative to cause the sheet storage and retrieval device 726 to deliver the acceptable sheets therefrom. The transport 712 is operative to move each sheet to an appropriate storage area in the machine. For example sheets which are checks may be stored in the storage device 660. Sheets which are notes may be stored in connection with the sheet recycler device 658 or in another suitable sheet storage area. It should be understood that a plurality of different types of sheet storage areas may be included in the machine for storage of one or more types of sheets.

Although in the exemplary embodiment sheets received in the machine are aligned with the sheet path before being analyzed and stored on the sheet storage and retrieval device 722, there is a risk that sheets may become misaligned as they are attempted to be moved out of the machine and through the opening 699 to the user. The exemplary embodiment includes features operative to minimize the risk of sheets becoming jammed or otherwise rendering the deposit accepting device inoperative because of such misalignment. The exemplary embodiment includes sheet sensors 735 and 737 as schematically represented in FIG. 43. The sheet sensors 735 and 737 are disposed in a first direction inwardly relative to the opening 699 through which sheets pass in and out of the machine. Each of the sensors 735 and 737 are disposed transversely relative to the area where sheets normally move in the sheet path. Each of these sensors is also in operative connection with at least one processor through appropriate interfaces.

If during operation of the machine, when sheets are being returned to the sheet access area, a sheet is sensed by one of the sensors, it is an indication to the at least one processor that a sheet is substantially out of alignment with the opening 699 and may present a problem if it is continued to be moved toward the sheet access area. In the exemplary embodiment responsive to the sensing of the sheet by either sensor 735 or 737, the at least one processor is operative to cause the transport to stop the movement of the sheet in the outward direction toward the opening. The at least one processor then operates to cause the transport to move the sheet into the sheet alignment area. This is done by moving the sheet inward into the machine from the area of the sensor 735 or 737 which sensed the sheet. The at least one processor then causes the devices in the sheet alignment area to engage the sheet and align it with the transport path. This is done in a manner like that previously described by moving the sheet transversely such that an edge of the sheet is aligned with the virtual wall formed by sensors 734. Once the sheet is aligned the at least one processor then causes the sheet to be reengaged with the transport which attempts to move the sheet outward through

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the opening 699 and into the sheet access area. In the exemplary embodiment the fact that the sheet has been aligned and is in a proper orientation is determined responsive to the fact that the sheet is not sensed by either of sensors 735 or 737. Of course it should be understood that this approach is exemplary and in other embodiments other approaches may be used. This may include for example having a plurality of sensors spaced transversely or in other locations in the sheet path which can be used to determine the location and/or orientation of the document.

Further in the exemplary embodiment if an attempt is made to align a sheet with the sheet path so it can be returned through the opening, and despite this effort the sheet is again sensed as out of alignment, the at least one processor will operate in accordance with its programming to make a further attempt to align the sheet with the sheet path. This second attempt in the exemplary embodiment again involves engaging the sheet with the transverse transports and aligning it with the sheet path. If after this second attempt when the machine operates to try to return the sheet to the sheet access area and there is again sensed an indication that the sheet is misaligned, the at least one processor will thereafter operate in accordance with its programming to cause at least one message to be sent from the automated banking machine to a remote computer to indicate that there is a probable jam and malfunction of the deposit accepting device. Alternatively or in addition in some embodiments the at least one processor may operate to take other remedial actions. These may include for example attempting to realign the sheet additional times. Alternatively or in addition the at least one processor may operate to again accept the sheet into a storage device in the machine, or the at least one processor may cause the sheet to move the sheet in the transport to a location in the machine for such sheets that cannot be processed. Of course these approaches are exemplary and in other embodiments other approaches may be used.

Rejected sheets that have been moved to the second side of the divider plate are returned to the banking machine user in a manner shown in FIGS. 66 and 67. The rejected sheets 760 are held in a stack on the upper side of the divider plate. The at least one processor is operative to cause belt flight 688 and divider plate 690 to move downward such that the rejected sheets are in sandwiched relation between belt flight 688 and belt flight 686. The at least one processor is then operative to open the gate 680. The processor operates to cause at least one drive to move the belts so as to extend the sheets in the stack 670 outward through the opening in the housing of the machine.

It should be understood that in exemplary embodiments the rejected sheets may be returned to the user while the accepted sheets are being moved to other storage locations in the machine. Alternatively in some embodiments the user may be given the option by the banking machine to have all of the sheets that they have deposited, returned. This may be accomplished in the exemplary embodiment by the sheets in the sheet storage and retrieval device 726 being moved through the sheet path to the sheet access area. Alternatively or in addition, in some embodiments the user may be offered the opportunity to retry the unacceptable sheets. In still other embodiments the machine may operate to hold in storage unacceptable sheets which the at least one processor has determined may be associated with the user attempting to perpetrate a fraud. Of course these approaches are exemplary and in other embodiments other approaches may be used.

In still other alternative embodiments sheets may be determined as unacceptable relatively quickly, and may be identified as sheets that should be returned to a user before all of the

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sheets in the stack input by the user to the sheet access area have been picked. Alternatively or in addition a user may provide one or more inputs indicating that they wish to abort a transaction prior to all of the sheets in the input stack being picked. These situations may be associated with the configurations of the exemplary deposit accepting device shown in FIGS. 58 and 59. For example a rejected sheet 762 may be returned to the sheet access area prior to all the sheets from the sheet stack having been picked. This may be the result of the rejected sheet 762, having been analyzed and determined to be unacceptable. Alternatively in some embodiments the rejected sheet may be the result of the user indicating that they wish to abort the transaction. As shown in FIGS. 58 and 59, such a rejected sheet is diverted through operation of the diverter 730 into the second side 694 such that the sheet is supported on the upper side of the divider plate 690.

The return of sheets to the banking machine user is represented in FIGS. 60 and 61. The at least one processor is operative to cause the divider plate 690 and belt flight 688 to move downward such that the sheets which are on each side of the divider plate are in sandwiched relation between the belt flights 686 and 688. The at least one processor is operative to open the gate 680 and to move the belt flights as shown such that the sheets on each side of the divider plate are moved outward through the opening 678 in the housing. The user may then take the sheets from the machine.

FIGS. 62 through 65 represent an exemplary operation that can be carried out by the machine if the user does not take the checks or other sheets that have been presented to the user by the machine. As shown in FIG. 62 the sheets which are positioned on both sides of the diverter plate 690 are moved through operation of the belt flights toward the picker. Upon the stacks of sheets reaching the picker, the gate 680 is closed. The picker 700 is then operated to pick the sheets. The sheets are picked from the area 692 below the diverter plate and then from the side 694 above the diverter plate. This is achieved because in the area adjacent the picker, the sheets regardless of whether they are above or below the diverter plate generally form a continuous sheet stack which enables all the sheets to be picked regardless of whether they are above or below the divider plate.

In the exemplary embodiment the at least one processor is operative to cause the retracted sheets to be stored in a suitable area of the machine. The machine is further operative to record the fact that the user did not take the presented sheets. This enables the sheets to eventually be traced to and/or returned to the particular user. Of course this approach is exemplary and in other embodiments other approaches to operation of the machine may be used. It should be understood however that in this exemplary embodiment the machine operates to clear the sheet access area so that transactions can be conducted for subsequent banking machine users even though a user did not take their presented sheets.

A further aspect of the exemplary embodiment is the use of a thumper member 764 in connection with picking sheets from the stack. In the exemplary embodiment the thumper member 764 is a rotating member including a raised area. It is aligned with the opening in the divider plate. The raised area is operative to displace the sheet and urge the sheet bounding the lower end of the stack to move into engagement with the picker 700. The bouncing movement of the stack of sheets is operative to help break the forces associated with surface tension and to help to separate the lowermost sheet from the stack. As previously discussed, when the divider plate acts on top of a stack of sheets, or a driver member acts on top of a stack of sheets, the force applied by the thumper member to

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the sheets is enhanced. Of course this approach is exemplary and in other embodiments other approaches may be used.

In a further aspect of an exemplary embodiment, sensors are provided for determining the positions of sheets in this sheet access area. As can be appreciated in the exemplary embodiment one pair of opposed belt flights are operative to operatively engage and move sheets both above and below the divider plate. In operating the exemplary banking machine the at least one processor is operative to determine the location of sheets, and specifically whether sheets are present on the first side 692 below the divider plate 690 or in the second side 694 above the divider plate.

This is accomplished in an exemplary embodiment through an arrangement shown in FIGS. 68 and 69. FIG. 69 shows a plan view of a portion that corresponds to half of the divider plate 690. In the exemplary embodiment the divider plate 690 includes reflective pieces 766 and 768 thereon. In the exemplary embodiment reflective pieces 766 and 768 comprise a piece of tape that is operative to reflect radiation therefrom. In an exemplary embodiment the tape may be an adhesive backed tape although in other embodiments other materials and pieces may be used. Further the exemplary embodiment of the portion of the divider plate 690 includes apertures 770 and 772 therein.

Further in the exemplary embodiment the reflective pieces are angular reflective pieces. This includes in the exemplary embodiment material with angular reflective properties such that radiation striking the reflective piece at an acute angle is reflected from the reflective piece back at the same or almost the same acute angle. This is accomplished in an exemplary embodiment due to the orientation of reflective elements within the reflective piece. Thus for example as shown in FIG. 68 a sensor 774 which includes a radiation emitter and a radiation receiver is enabled to sense whether reflective piece 766 is covered by at least one adjacent sheet. Further the sensor 774 is enabled to sense that reflective piece 766 is covered or uncovered from a position that is laterally disposed from the side 694 in which sheets may be positioned. Likewise a similar sensor 776 is operative to sense whether a sheet is covering reflective piece 768 in a position disposed laterally from the divider plate. As can be appreciated these sensors enable the sensing of whether sheets are present, as well as their position on the second side 694 above the divider plate 690.

Also in this exemplary embodiment the sensor 778 includes emitter 780 and a receiver 782. The emitter 780 and receiver 782 are disposed from one another and aligned with aperture 770. As a result the ability of the receiver 782 to sense radiation from the emitter 780 indicates that sheets are not present either on the first side 692 or the second side 694 in the area of aperture 770. Similarly a sensor 784 which includes an emitter 786 and a receiver 788 is operative to determine if sheets are present either on the first side 692 or on the second side 694 in the area of aperture 772.

Further in an exemplary embodiment, a sheet support plate 790 is positioned in generally parallel relation with belt flight 686 and extends laterally on each transverse side thereof. A reflective piece 792 supported thereon operates in conjunction with the sensor 794. Sensor 794 is of a type similar to sensor 774 and includes an emitter and adjacent receiver. Similarly a reflective piece 796 operates in conjunction with a sensor 798. Such reflective pieces and sensors may be used to independently sense the presence and/or location of sheets on the first side 692. Further as can be appreciated, support plate 790 includes apertures 800 and 802 which are aligned with sensors 788 and 784 respectively. Further in other embodiments a support plate may be positioned adjacent to

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belt flight 688. Such a support plate may also include apertures and/or reflective elements positioned thereon. Such a support plate may be of the type previously described or may be of a different construction. Further such a support plate 5 may include angular reflective pieces so as to enable the sensing of sheets proximate thereto with a sensor that is positioned transversely of the area in which sheets may be positioned. As can be appreciated this ability to sense the sheets may include the positioning of the sensors transversely 10 from the sheet holding areas and positions as may be convenient and where space is available within the given housing structure of the automated banking machine.

This exemplary arrangement of sensors enables the at least 15 one processor to determine the presence and position of sheets on both the first side and the second side of the divider plate 690. The ability of the exemplary embodiment to sense in such areas through the use of sensors which are laterally disposed away from the area in which sheets must pass, provides benefits in terms of being able to position the sensors 20 in ways that do not interfere with the movement of the device components. It should be understood however that these approaches are exemplary and in other embodiments the use of different types of sensors for the detection of sheets may be used.

It should be understood that in the exemplary embodiment 25 the deposit accepting device may also operate as part of the cash dispenser of the machine. This may be accomplished for example, through operation of the processor which causes currency sheets to be picked from the sheet dispenser device 656 and/or the sheet recycling device 758 for delivery to an ATM user. Such sheets may be moved through the various transports and delivered to the sheet access area. Such sheets 30 may be presented to the user through the opening in the ATM housing in the manner previously discussed. Of course while the exemplary embodiment enables the deposit accepting device to operate as part of the currency dispenser, in other embodiments a separate device may be used for dispensing currency sheets while the deposit accepting device is operative only to accept and store sheets. Of course these 35 approaches are exemplary and in other embodiments other approaches may be used.

In addition it should be understood that although in the 40 exemplary embodiment particular structures are disclosed for the sheet moving devices, divider plate and other sheet handling mechanisms, in other embodiments other structures may be used. This may include for example additional numbers of divider plates and sheet moving devices. Alternatively or in addition rather than using a split divider plate having two portions as in the exemplary embodiment, other embodiments 45 may include divider plates with apertures which can accept rollers, balls or other types of sheet moving devices therein. In addition while the exemplary embodiment is described in connection with sheet handling devices that move belts and the divider plate relatively vertically to one 50 another, and in which the vertical position of the lower belt is fixed, other embodiments may include different arrangements. These arrangements may include transports and divider plates which move horizontally or angularly relative to one another to achieve the delivery and acceptance of 55 sheets from a user. Further additional devices and structures 60 may be combined with or used in lieu of the structures and devices described in connection with the exemplary embodiments herein.

Thus the exemplary embodiments achieve at least some of 65 the above stated objectives, eliminate difficulties encountered in the use of prior devices and systems, and attain the useful results described herein.

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In the foregoing description certain terms have been described as exemplary embodiments for purposes of brevity, clarity and understanding. However no unnecessary limitations are to be implied therefrom because such terms are used for descriptive purposes and are intended to be broadly construed. Moreover the descriptions and illustrations herein are by way of examples and the invention is not limited to the features shown or described.

Further, in the following claims any feature described as a means for performing a function shall be construed as encompassing any means known to those skilled in the art as being capable of carrying out the recited function, and shall not be deemed limited to the particular means shown or described for performing the recited function in the foregoing description, or mere equivalents thereof.

Having described the features, discoveries and principles of the invention, the manner in which it is constructed and operated, any of the advantages and useful results attained; the new and useful structures, devices, elements, arrangements, parts, combinations, systems, equipment, operations, methods, processes and relationships are set forth in the appended claims.

We claim:

**1.** A method of sensing magnetic indicia on at least one financial check, comprising:

(a) receiving at least one check in an automated banking machine, wherein the at least one check includes a check comprising magnetic indicia encoded in a micr line thereon;

(b) sensing through operation of at least one sensor in the machine, a width associated with the check, wherein the at least one sensor is in operative connection with at least one processor in the machine;

(c) moving responsive at least in part to the width sensed in (b), at least one of two magnetic read heads in the machine, wherein the at least one magnetic read head is moved responsive at least in part to operation of the at least one processor, wherein the at least one magnetic read head is moved such that the micr line on the check is aligned with one of the magnetic read heads regardless of a facing position of the check;

(d) moving the check past the two magnetic read heads in the machine responsive at least in part to operation of the at least one processor;

(e) sensing micr line data on the check with one of the two magnetic read heads.

**2.** The method according to claim 1 wherein (a) comprises receiving a plurality of checks in the machine, wherein the plurality of checks are received in a stack in a sheet access area of the machine, and further comprising:

(f) prior to (b) separating the check from the stack through operation of a picker.

**3.** The method according to claim 2 and further comprising:

(g) prior to (b) aligning the check with a transport path in which the check moves in the machine responsive at least in part to operation of the at least one processor.

**4.** The method according to claim 3 wherein (g) includes operatively engaging the check with at least one transverse transport, wherein the at least one transverse transport moves the check generally transverse of the transport path.

**5.** The method according to claim 4 wherein a first magnetic read head is mounted in a fixed position relative to the transport path, and wherein in (g) the at least one transverse transport is operative to align the micr line on the check on the first magnetic read head in two of four possible facing positions of the check.

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6. The method according to claim 5, wherein a second magnetic read head is movably mounted transversely relative to the transport path, and wherein in (c) the second magnetic read head is moved to align with the micr line on the check when the check is in two of four possible facing positions.

7. The method according to claim 6 and further comprising:

(h) subsequent to (e) interpreting the micr line data on the check through operation of the at least one processor, wherein the at least one processor is operative to interpret the micr line data read by either the first or second magnetic read head in any of forward, backward, right side up or upside down orientations.

**8.** The method according to claim 7 and further comprising:

(i) subsequent to (a), repeating steps (b) through (h) for each of the plurality of checks in the stack.

**9.** The method according to claim 1 wherein (a) includes receiving a plurality of checks in a sheet access area of the machine, wherein the sheet access area includes a divider plate, and wherein in (a) the checks are received on a first side of the divider plate.

**10.** The method according to claim 9 and further comprising:

(f) returning at least one check to the sheet access area, wherein the at least one check is returned on a second side of the divider plate opposed of the first side.

**11.** The method according to claim 10 and further comprising:

(g) subsequent to (f), picking at least one check on the second side of the divider plate through operation of a picker.

**12.** The method according to claim 1 and further comprising:

(f) prior to (b), reading data from a user card through operation of a card reader in the machine;

(g) determining responsive at least in part to operation of the machine, that the data read in (f) corresponds to an authorized user;

(h) carrying out at least one of steps (b) through (e) responsive at least in part to the determination in (g).

**13.** The method according to claim 1 wherein (a) includes receiving a plurality of checks in the machine, and further comprising:

(f) determining a value associated with at least one check received in (a);

(g) crediting a machine user with the value responsive at least in part to operation of the machine.

**14.** The method according to claim 13 and further comprising:

(h) dispensing cash from the machine to the machine user.

**15.** The method according to claim 1 wherein (a) includes receiving a plurality of checks in a sheet access area of the machine, and further comprising:

(f) storing a plurality of the checks received in (a) in the machine in a first sheet storage and retrieval device;

(g) moving at least one check from the first sheet storage and retrieval device to the sheet access area.

**16.** The method according to claim 15 wherein the machine includes a second sheet storage and retrieval device, and further comprising:

moving at least one check from the first sheet storage and retrieval device to the second sheet storage and retrieval device.

**17.** A method of operation of a magnetic coded record sensing structure, comprising:

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(a) sensing a width dimension associated with a magnetic coded record through operation of at least one width sensor in a machine operative to read magnetic indicia in a line on the coded record;

(b) moving at least one of two magnetic read heads through operation of the machine to cause at least one of the magnetic read heads to be aligned with the magnetic indicia regardless of a facing position of the coded record.

**18.** A method comprising:

(a) operating an automated banking machine to obtain at least one dimensional feature associated with a financial check including micr line magnetic data,

wherein the machine includes a check analysis area,

wherein the check analysis area includes a check transport path in which checks are movable in any of four facing positions,

wherein the check analysis area includes plural magnetic read heads,

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15

**44**

wherein the plural magnetic read heads include a first magnetic read head and a second magnetic read head;

(b) operating the machine based at least in part on the at least one dimensional feature obtained in (a), to move the first magnetic read head relative to the second magnetic read head;

(c) subsequent to (b), operating the machine to move the check in the check transport path; and

(d) during at least a part of (c), operating the machine to cause magnetic read head reading of the micr line magnetic data regardless of the facing position of the check.

**19.** The method according to claim **18** wherein the first magnetic read head and the second magnetic read head are mounted adjacent the check transport path, wherein the first magnetic read head is movably mounted.

**20.** The method according to claim **19** wherein the second magnetic read head is fixedly mounted.

\* \* \* \* \*

# **EXHIBIT C**

**Exhibit C****Claim Chart Showing Infringement of U.S. Patent No. 6,082,616 by Hyosung ATMs<sup>1</sup>**

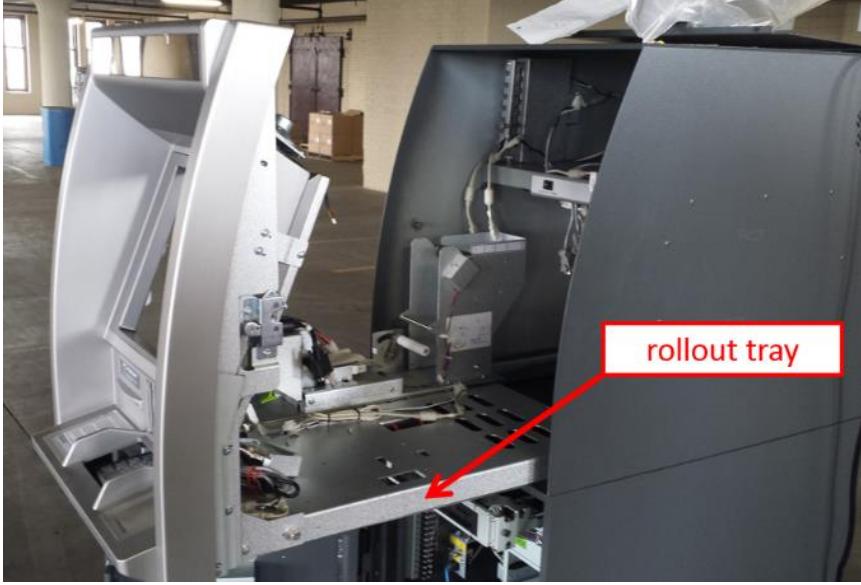
Each Hyosung ATM having a rollout tray with a service opening or similar structures directly and/or indirectly infringes the asserted claims of U.S. Patent No. 6,082,616. Such models include, but are not limited to: the Halo, Halo S, NH2600, MX2600, Halo II, MX2600SE, MX5000CE, MX5000SE, MX5200XP, MX5200W7, MX5200SE, MX5300, MX5300CE, MX5300XP, and MX5600 ATMs (collectively, the “Hyosung Rollout Tray ATMs”).

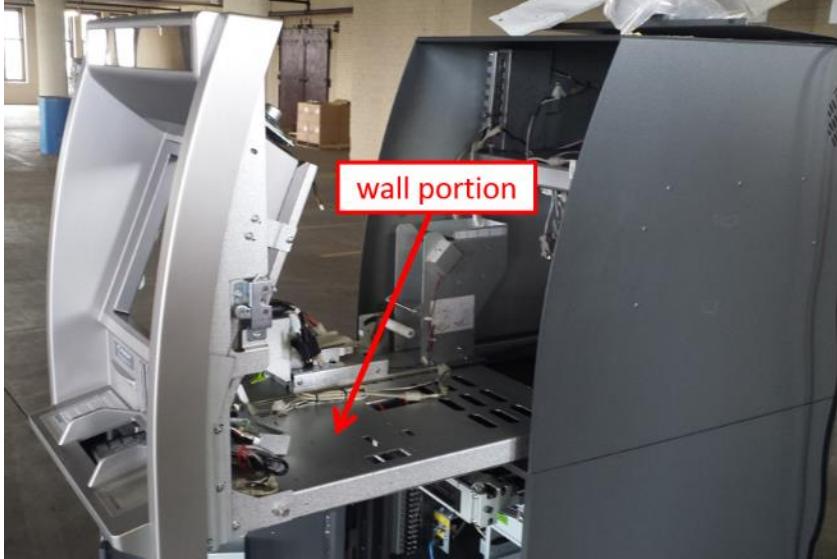
The following chart includes exemplary citations to documentation for a Nautilus Hyosung MX5600 ATM. This documentation is representative of the operation of the Hyosung Rollout Tray ATMs. Diebold contends that each of the following limitations is met literally, and, to the extent a limitation is not met literally, it is met under the doctrine of equivalents.

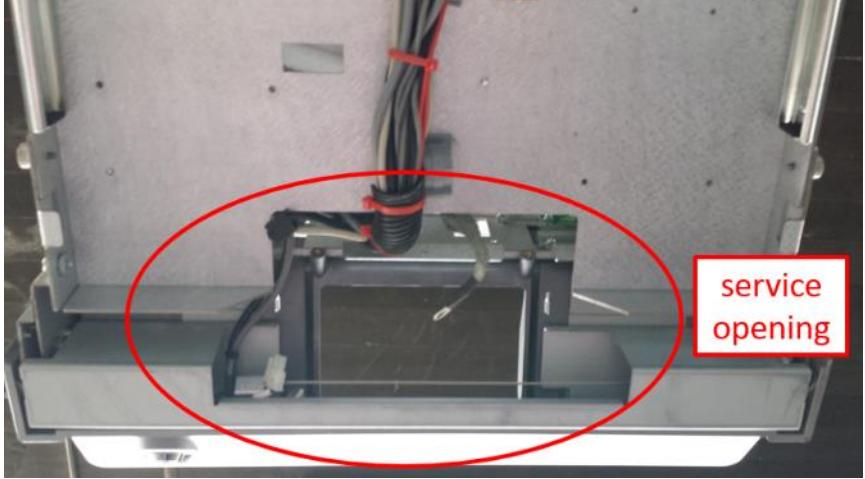
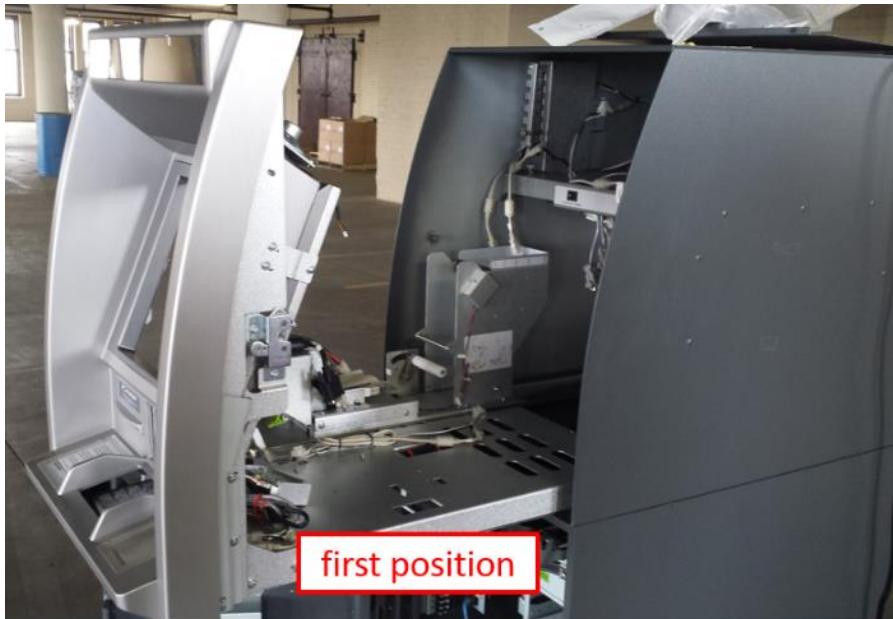
<b>Claim 1</b>	<b>Nautilus Hyosung ATM</b>
[1pre] An automated banking machine apparatus comprising:	<p>Hyosung Rollout Tray ATMs are an automated banking machine apparatus as recited in claim 1. For example:</p>  <p><i>See Exhibit D (“Monimax 5600 Specifications”) at 1.</i></p> <p><i>See also In the Matter of Certain Automated Teller Machines, ATM</i></p>

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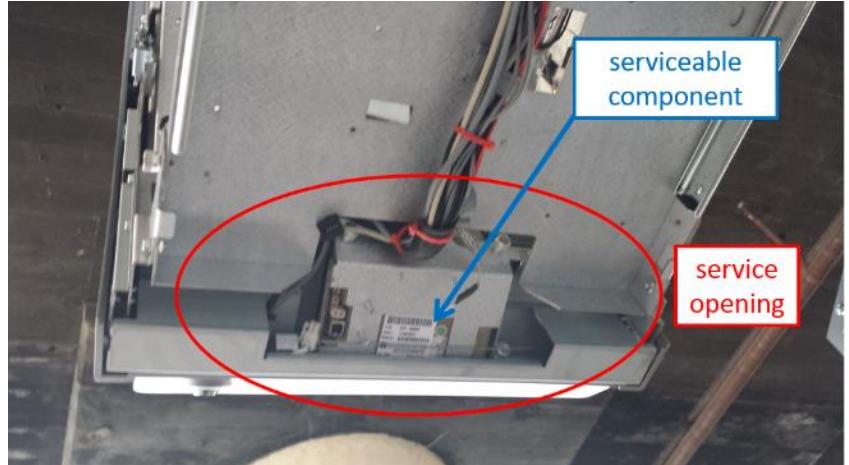
<sup>1</sup> This claim chart is based on the information currently available to Diebold and is intended to be exemplary in nature. Diebold reserves all rights to update and elaborate its infringement positions, including as Diebold obtains additional information during the course of discovery.

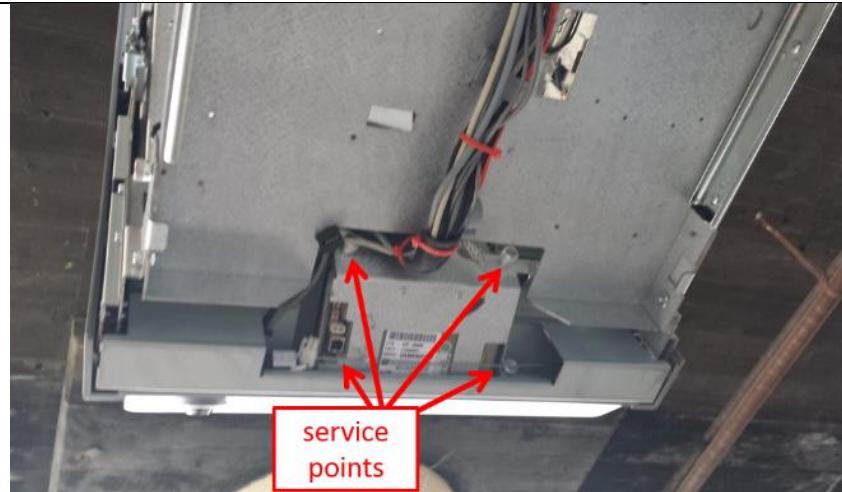
	<i>Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i>
[1a] a housing bounding an interior area, the housing having a first opening to the interior area;	<p>Hyosung Rollout Tray ATMs include a housing bounding an interior area, the housing having a first opening to the interior area as recited in claim 1. For example:</p>  <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[1b] a rollout tray movably supported on the housing,	<p>Hyosung Rollout Tray ATMs include a rollout tray movably supported on the housing as recited in claim 1. For example:</p>  <p><i>See also In the Matter of Certain Automated Teller Machines, ATM</i></p>

	<i>Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i>
[1c] the rollout tray including a wall portion,	<p>Hyosung Rollout Tray ATMs include a rollout tray including a wall portion as recited in claim 1. For example:</p>  <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[1d] a service opening extending through the wall portion,	<p>Hyosung Rollout Tray ATMs include a service opening extending through the wall portion as recited in claim 1. For example:</p> 

	 <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[1e] wherein the rollout tray is movable between a first position wherein the tray extends outward from the first opening and the service opening is accessible from outside the housing,	<p>Hyosung Rollout Tray ATMs include a rollout tray that is moveable between a first position wherein the tray extends outward from the first opening and the service opening is accessible from outside the housing as recited in claim 1. For example:</p> 

	 <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[1f] and a second position wherein the tray is within the interior area and the service opening is not accessible from outside the housing;	<p>Hyosung Rollout Tray ATMs include a second position wherein the tray is within the interior area of the service opening and not accessible from outside the housing as recited in claim 1. For example:</p>  <p><i>See Exhibit D (“Monimax 5600 Specifications”) at 1.</i></p> <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[1g] a first serviceable	<p>Hyosung Rollout Tray ATMs include a first serviceable component mounted in supporting connection with the tray and overlying the service</p>

<p>component mounted in supporting connection with the tray and overlying the service opening,</p>	<p>opening as recited in claim 1. For example:</p>  <p><i>See Exhibit D (“Monimax 5600 Specifications”) at 2.</i></p>  <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
<p>[1h] the serviceable component having a service point,</p>	<p>Hyosung Rollout Tray ATMs include a serviceable component having a service point as recited by claim 1. For example:</p>



4) Remove the screws and connectors to disassemble the EPP.

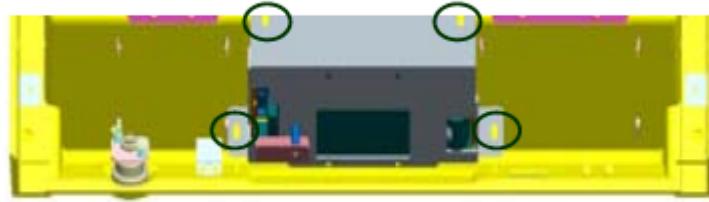


Fig 4.8 The disassembly procedure of EPP module

See Exhibit E (“Monimax 5600 Maintenance Manual”) at 4-37.

6) Disassemble EPP by removing 4 screws as pictured below.

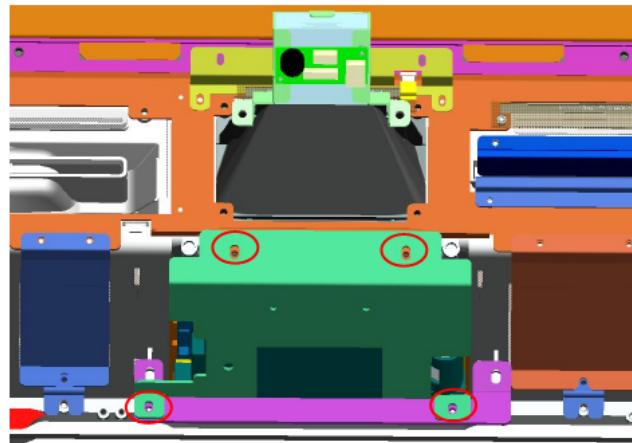
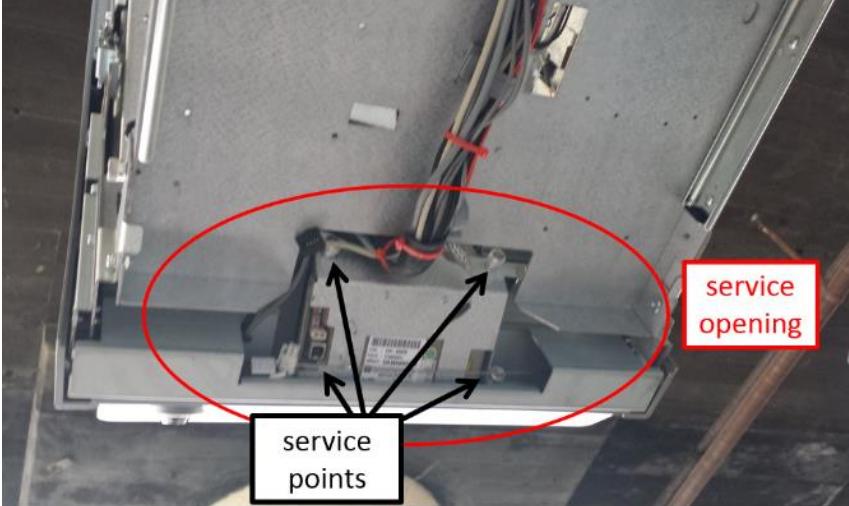
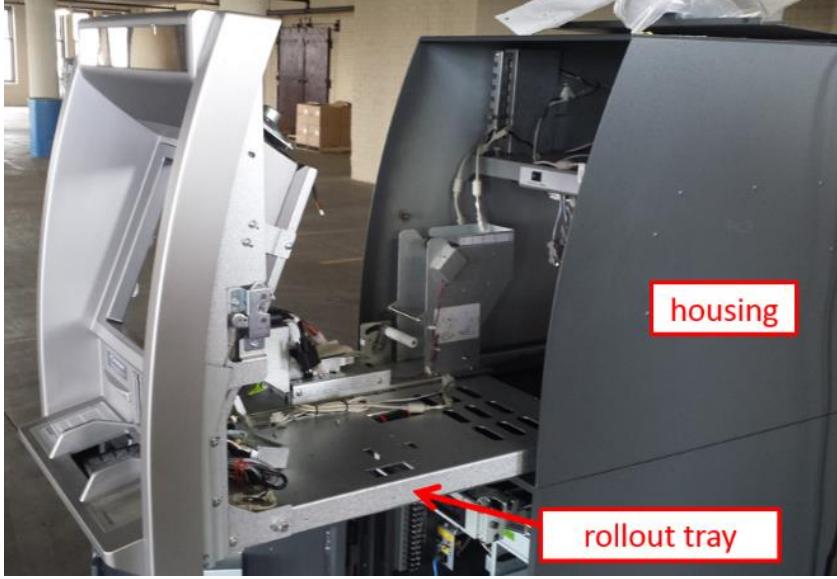
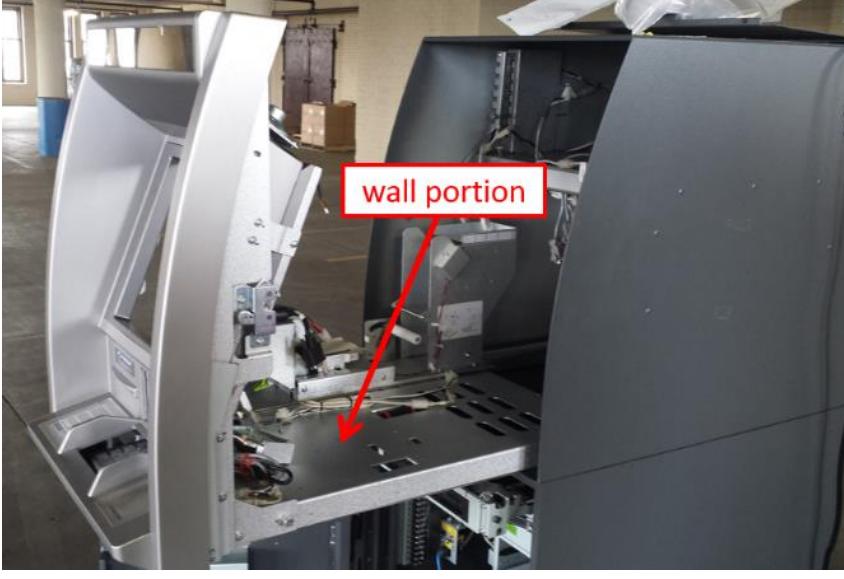


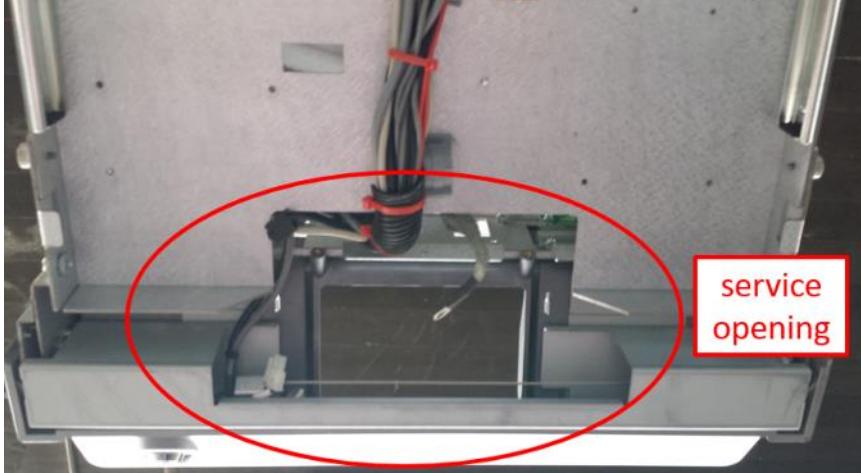
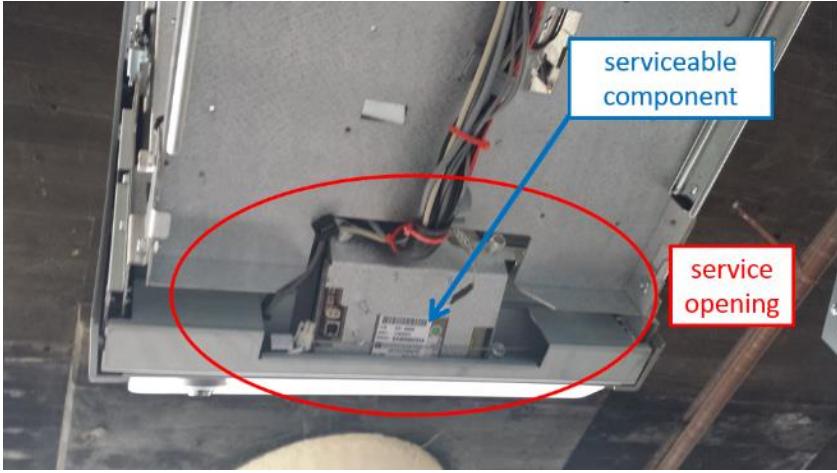
Fig 4.9 The disassembly procedure of EPP module

See Exhibit F (“Monimax 5600T Maintenance Manual”) at 4-22.

See also *In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same,*

	Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).
[1i] and wherein the service point is accessible from outside the housing by extending a tool upwardly through the service opening when the tray is in the first position.	<p>Hyosung Rollout Tray ATMs include a service point that is accessible from outside the housing by extending a tool upwardly through the service opening when the tray is in the first position as recited by claim 1. For example:</p>  <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
<b>Claim 20</b>	<b>Nautilus Hyosung ATMs</b>
[20pre] A method comprising the steps of:	<p>Hyosung Rollout Tray ATMs have been and/or could be used to practice the method of claim 20, as explained below.</p> <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[20a] extending a rollout tray from a housing of an automated banking machine,	<p>Hyosung Rollout Tray ATMs includes a rollout tray that has and/or could be extended from a housing of an automated banking machine as recited in claim 20. For example:</p>

	 <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[20b] the rollout try having a lower wall portion with a service opening extending therethrough and having a serviceable component supported by the tray,	<p>Hyosung Rollout Tray ATMs include a rollout tray having a lower wall portion with a service opening extending therethrough and having a serviceable component supported by the tray as recited in claim 20. For example:</p> 

	 
[20c] wherein the service opening becomes accessible by a tool from outside the housing when the tray is extended; and	<p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p> <p>Hyosung Rollout Tray ATMs include a service opening that has been and/or could become accessible by a tool from outside the housing when the tray is extended as recited in claim 20. For example:</p>



#### 4.4.4 Disassembling the EPP module

- 1) Insert the key on the front door and turn it clockwise.
- 2) Open the front door by pulling it out and turn power off.
- 3) Remove 2 screws on both sides of the front door and then pull the front outward.



- 4) Remove the screws and connectors to disassemble the EPP.

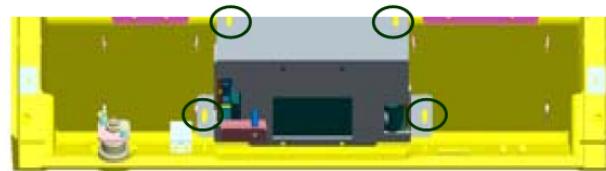
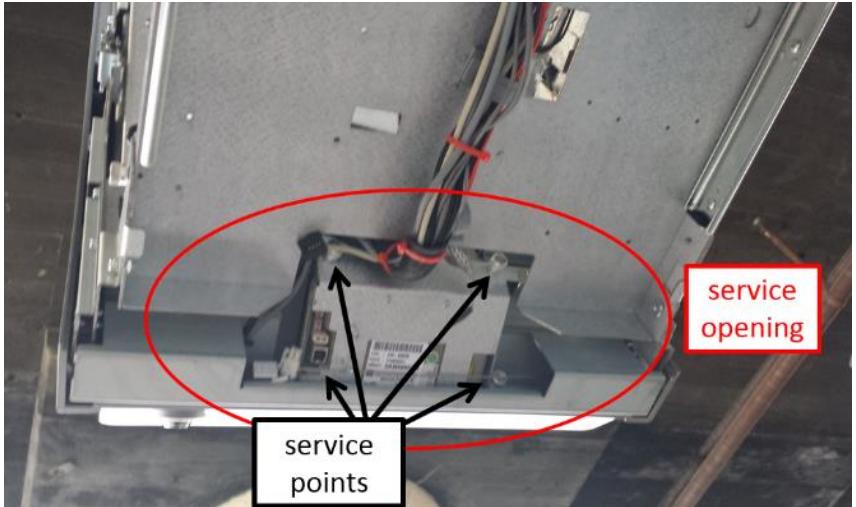


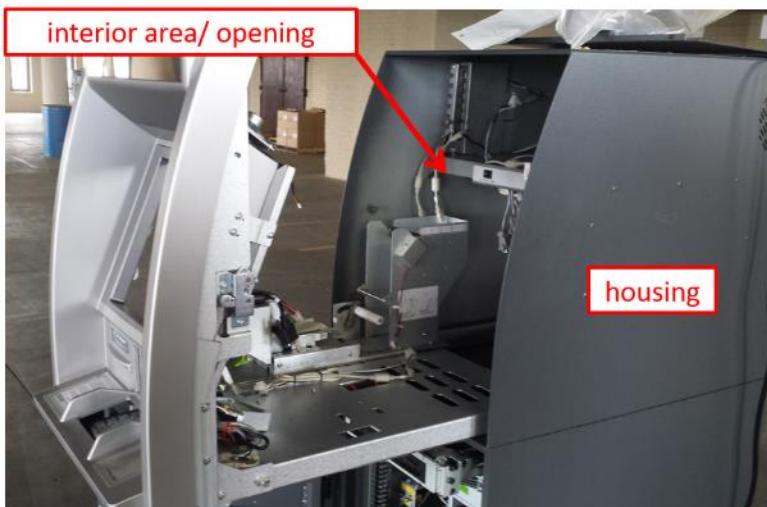
Fig 4.8 The disassembly procedure of EPP module

See Exhibit E (“Monimax 5600 Maintenance Manual”) at 4-37.

See also *In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same*, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).

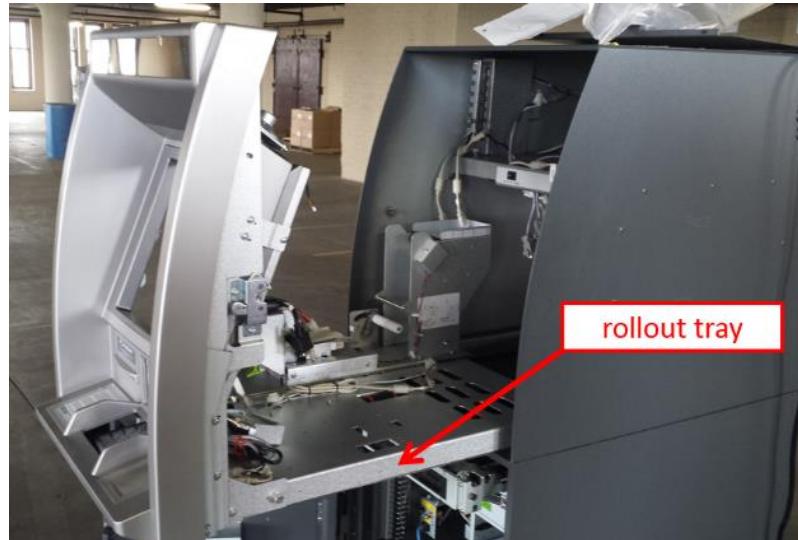
[20d]	Hyosung Rollout Tray ATMs include a service point on the serviceable
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<p>accessing a service point on the serviceable component by extending the tool upwardly through the service opening.</p>	<p>component that has been and/or could be accessed by extending the tool upwardly through the service opening as credited in claim 20. For example:</p> <p>4) Remove the screws and connectors to disassemble the EPP.</p>  <p>Fig 4.8 The disassembly procedure of EPP module</p> <p><i>See Exhibit E (“Monimax 5600 Maintenance Manual”) at 4-37.</i></p>  <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
<p><b>Claim 26</b></p> <p>[26pre] An automated banking machine apparatus comprising:</p>	<p><b>Nautilus Hyosung ATMs</b></p> <p>Nautilus Hyosung ATMs having a rollout tray, including, but not limited to the MX5600 are automated banking machines, as recited in claim 26. For example:</p>

	 <p><i>m</i></p> <p>See Exhibit D (“Monimax 5600 Specifications”) at 1.</p> <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[26a] a housing bounding an interior area, the housing having a first opening to the interior area;	<p>Hyosung Rollout Tray ATMs include a housing bounding an interior area, the housing having a first opening to the interior area, as recited in claim 26. For example:</p>  <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[26b] a rollout tray	<p>Hyosung Rollout Tray ATMs include a rollout tray moveably mounted in supporting connection with the housing, as recited in claim 26. For</p>

moveably mounted in supporting connection with the housing,

example:

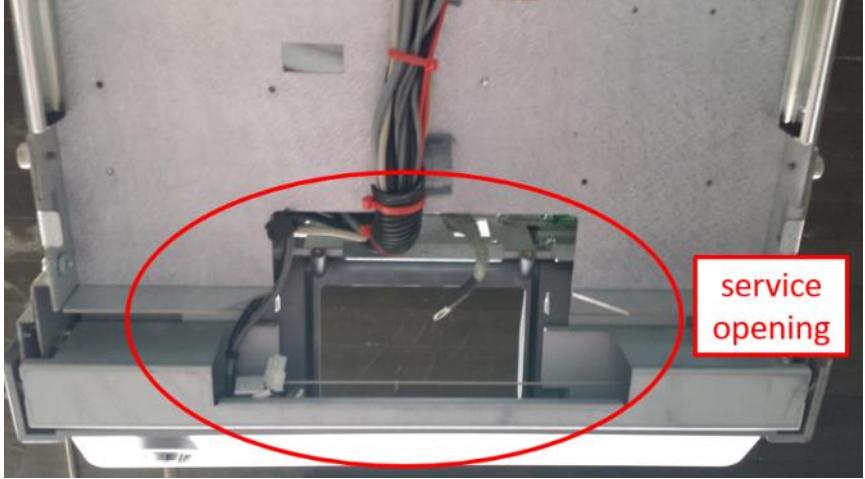


*See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).*

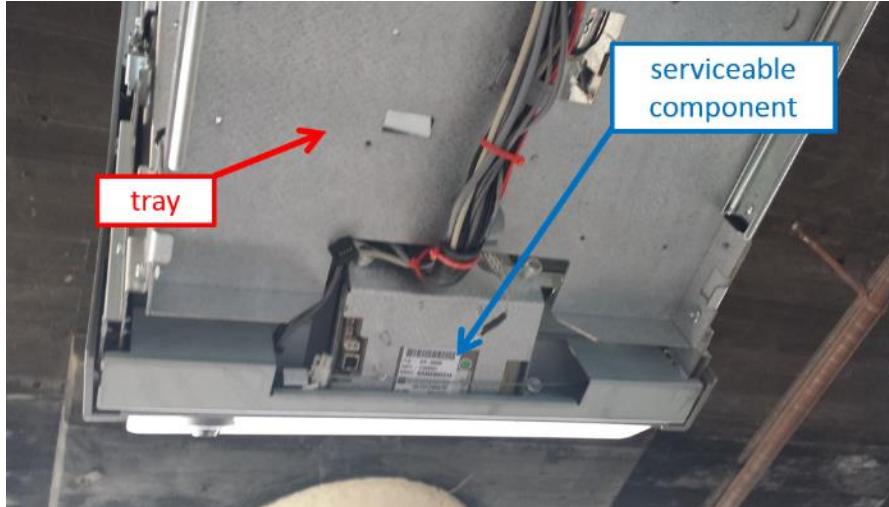
[26c] the rollout tray including a service opening,

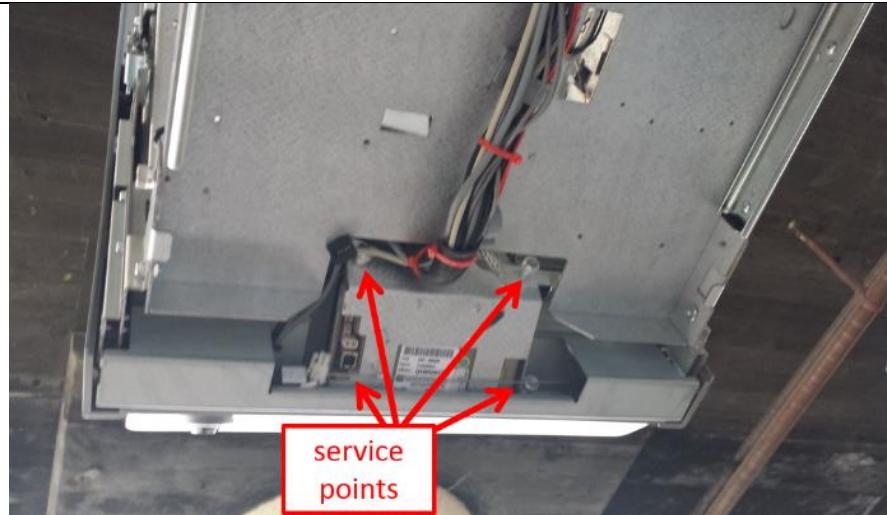
Hyosung Rollout Tray ATMs include a rollout tray including a service opening as recited in claim 26. For example:



	 <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[26d] wherein the rollout tray is moveable between a first position wherein the tray extends outward from the first opening and the service opening is accessible from outside the housing,	<p>Hyosung Rollout Tray ATMs includes a rollout tray moveable between a first position wherein the tray extends outward from the first opening and the service opening is accessible from outside the housing, as recited in claim 26. For example:</p> 

	 <p><i>service opening</i></p>
	<p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[26e] and a second position wherein the tray is within the interior area and the service opening is not accessible from outside the housing;	<p>Hyosung Rollout Tray ATMs include a second position wherein the tray is within the interior area and the service opening is not accessible from outside the housing, as recited in claim 26. For example:</p>  <p><i>second position</i></p>
	<p><i>See Exhibit D (“Monimax 5600 Specifications”) at 1.</i></p> <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[26f] a serviceable component mounted in supporting	<p>Hyosung Rollout Tray ATMs include a serviceable component mounted in supporting connection with the tray, as recited in claim 26. For example:</p>

<p>connection with the tray,</p>	 <p>The diagram shows a side view of an ATM machine. Labels with red callouts point to several parts: 'VFD (Vacuum fluorescent display)' points to the top screen; '15" color customer display' points to the main touchscreen; 'Graphical thermal receipt printer' points to the printer slot; and 'PCI compliant EPP' points to a blue oval around the bottom right corner of the machine. A red arrow also points to a 'tray' component.</p> <p><i>See Exhibit D ("Monimax 5600 Specifications") at 2.</i></p>  <p>A close-up photograph of the internal mechanism of an ATM tray. A red box labeled 'tray' points to the metal frame. A blue arrow points from a blue box labeled 'serviceable component' to a small electronic board or sensor located at the bottom of the tray assembly.</p> <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
<p>[26g] the serviceable component having a service point,</p>	<p>Hyosung Rollout Tray ATMs include a serviceable component having a service point, as recited in claim 26. For example:</p>



4) Remove the screws and connectors to disassemble the EPP.

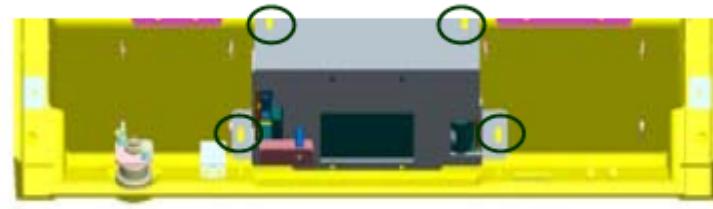


Fig 4.8 The disassembly procedure of EPP module  
See Exhibit E ("Monimax 5600 Maintenance Manual") at 4-37.

6) Disassemble EPP by removing 4 screws as pictured below.

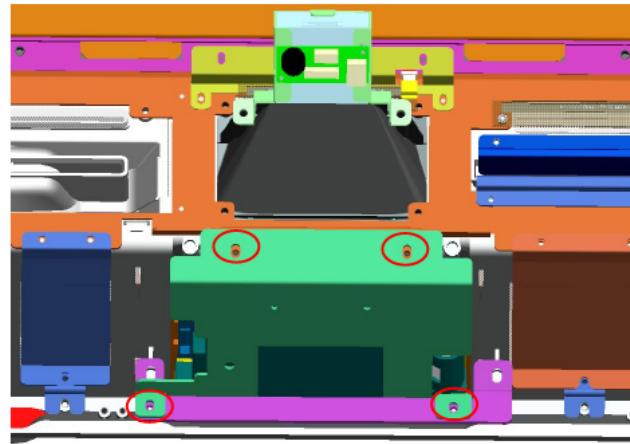
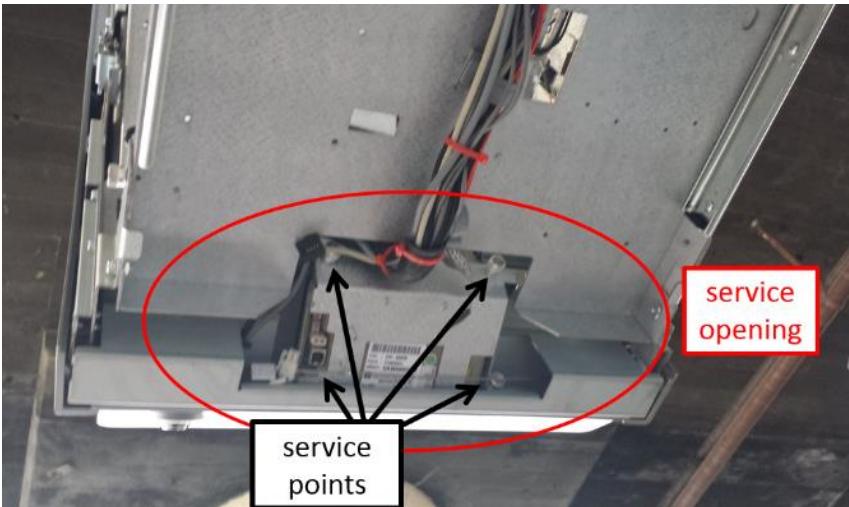
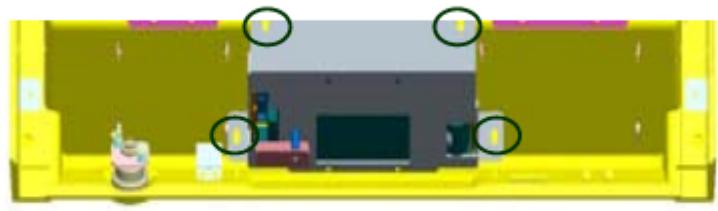
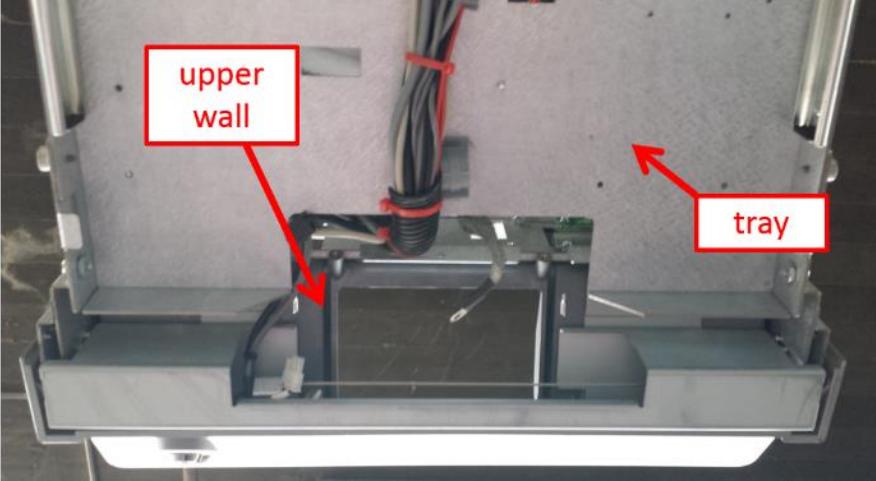
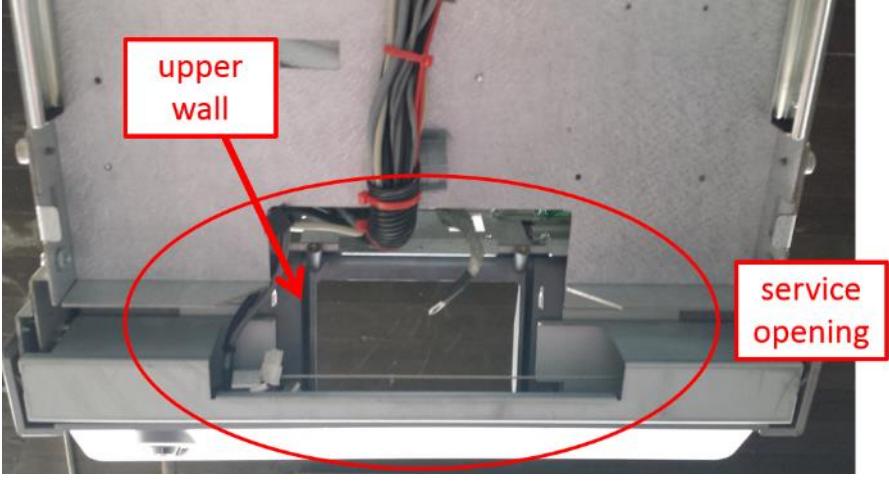
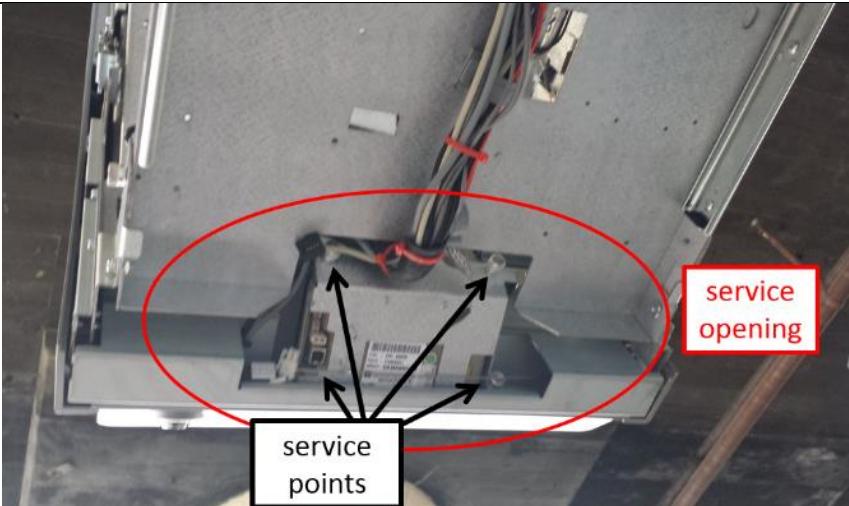
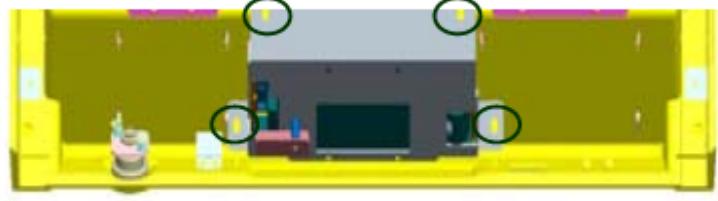


Fig 4.9 The disassembly procedure of EPP module  
See Exhibit F ("Monimax 5600T Maintenance Manual") at 4-22.

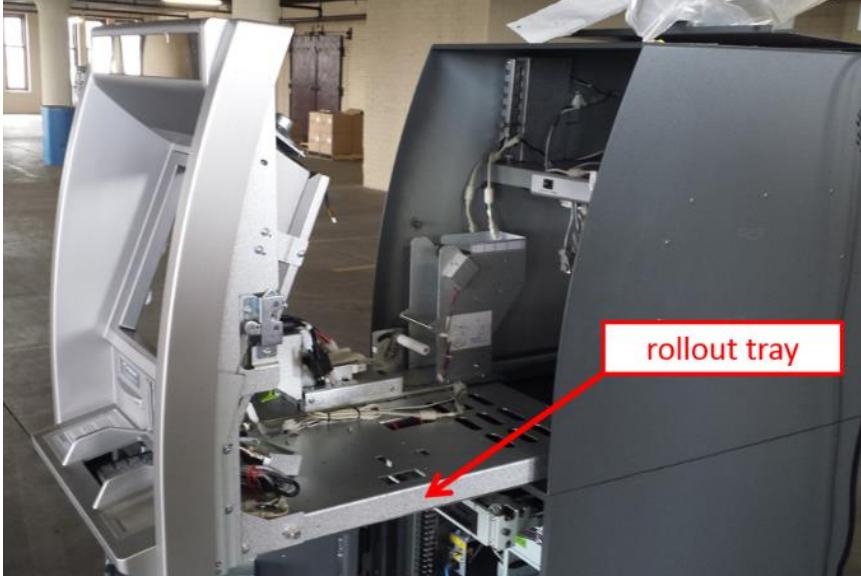
See also *In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same*,

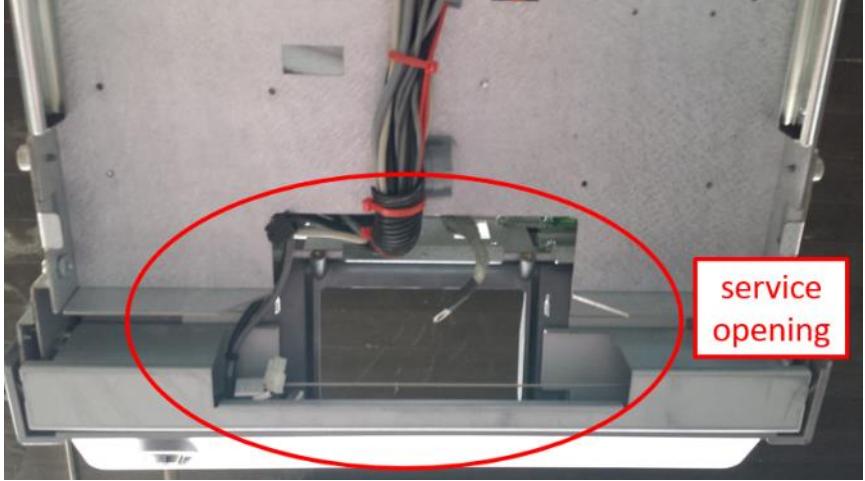
	Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).
[26h] and wherein the service point is accessible from outside the housing through the service opening when the tray is in the first position;	<p>Hyosung Rollout Tray ATMs include a service point accessible from outside the housing through the service opening when the tray is in the first position, as recited in claim 26. For example:</p>  <p>4) Remove the screws and connectors to disassemble the EPP.</p>  <p>Fig 4.8 The disassembly procedure of EPP module See Exhibit E (“Monimax 5600 Maintenance Manual”) at 4-37. See also <i>In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same</i>, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</p>
[26i] an upper wall in supporting connection with the tray,	Hyosung Rollout Tray ATMs includes an upper wall in supporting connection with the tray, as recited in claim 26. For example:

	 <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[26j] the wall disposed above the service opening, wherein the service point is disposed between the wall and the service opening.	<p>Hyosung Rollout Tray ATMs include a wall disposed above the service opening, wherein the service point is disposed between the wall and the service opening, as recited in claim 26. For example:</p> 

	
4) Remove the screws and connectors to disassemble the EPP.	
	
<p><b>Fig 4.8 The disassembly procedure of EPP module</b> See Exhibit E (“Monimax 5600 Maintenance Manual”) at 4-37.  See also <i>In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same</i>, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</p>	
Claim 27	<b>Nautilus Hyosung ATMs</b>
[27pre] An automated banking machine apparatus comprising:	Hyosung Rollout Tray ATMs are automated banking machines as recited by claim 27. For example:

	 <p><i>m</i></p> <p>See Exhibit D (“Monimax 5600 Specifications”) at 1.</p> <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[27a] a housing bounding an interior area, the housing having a first opening to the interior area;	<p>Hyosung Rollout Tray ATMs include a housing bounding an interior area, the housing having a first opening to the interior area, as recited in claim 27. For example:</p>  <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[27b] a rollout tray	<p>Hyosung Rollout Tray ATMs include a rollout tray movably mounted in supporting connection with the housing, as recited by claim 27. For</p>

<p>movably mounted in supporting connection with the housing,</p>	<p>example:</p>  <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
<p>[27c] wherein the rollout tray is movable between a first position wherein the tray extends outward from the first opening and wherein a service opening is accessible from outside the housing,</p>	<p>Hyosung Rollout Tray ATMs include a rollout tray moveable between a first position wherein the trya extends outward from the first opening and wherein a service opening is accessible from outside the housing, as recited in claim 27. For example:</p> 

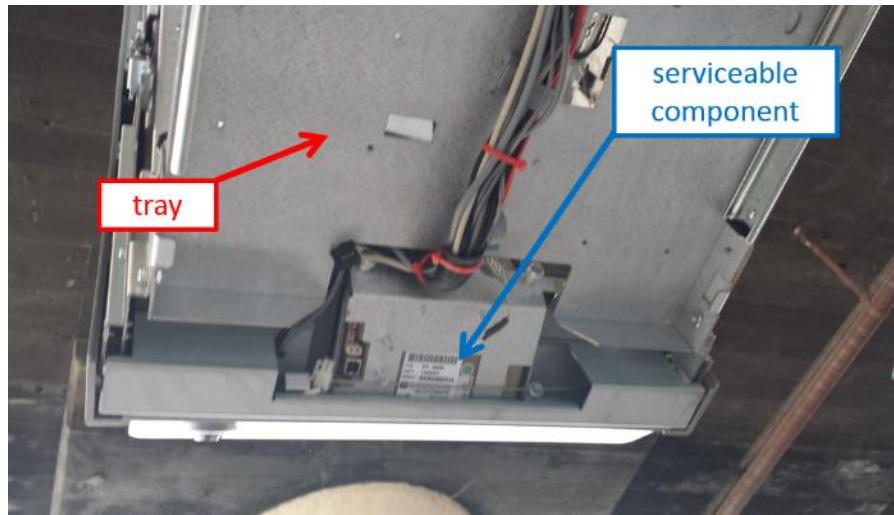
	
	<p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>
[27d] and a second position wherein the tray is generally within the interior area and the service opening is not accessible from outside the housing;	<p>Hyosung Rollout Tray ATMs include a second position wherein the tray is generally within the interior area and the service opening is not accessible from outside the housing, as recited in claim 27. For example:</p> 
[27e] a serviceable	<p>See Exhibit D (“Monimax 5600 Specifications”) at 1.</p> <p><i>See also In the Matter of Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).</i></p>

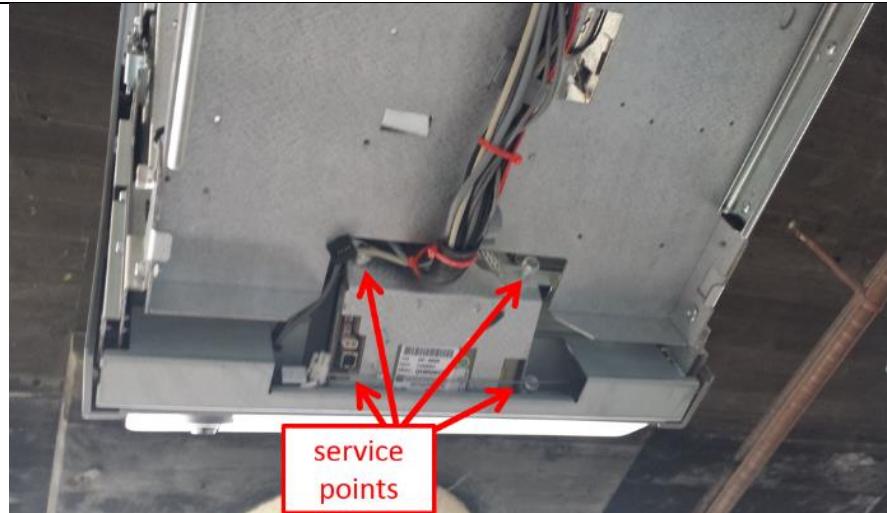
component mounted in supporting connection with the tray, the serviceable component having a service point,

a service point, as recited in claim 27. For example:



*See Exhibit D (“Monimax 5600 Specifications”) at 2.*





4) Remove the screws and connectors to disassemble the EPP.

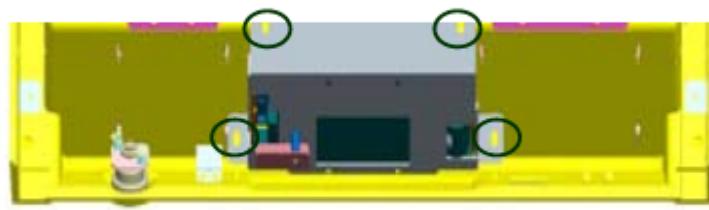


Fig 4.8 The disassembly procedure of EPP module  
See Exhibit E ("Monimax 5600 Maintenance Manual") at 4-37.

6) Disassemble EPP by removing 4 screws as pictured below.

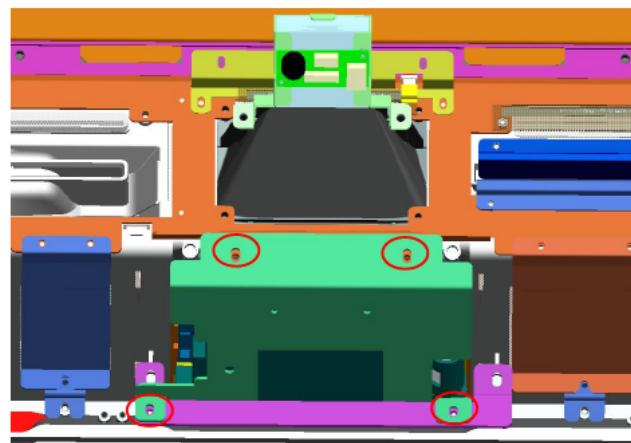
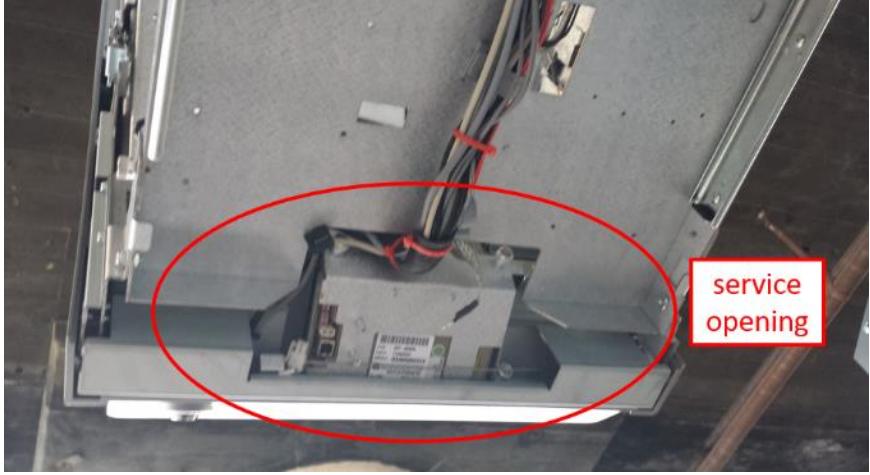
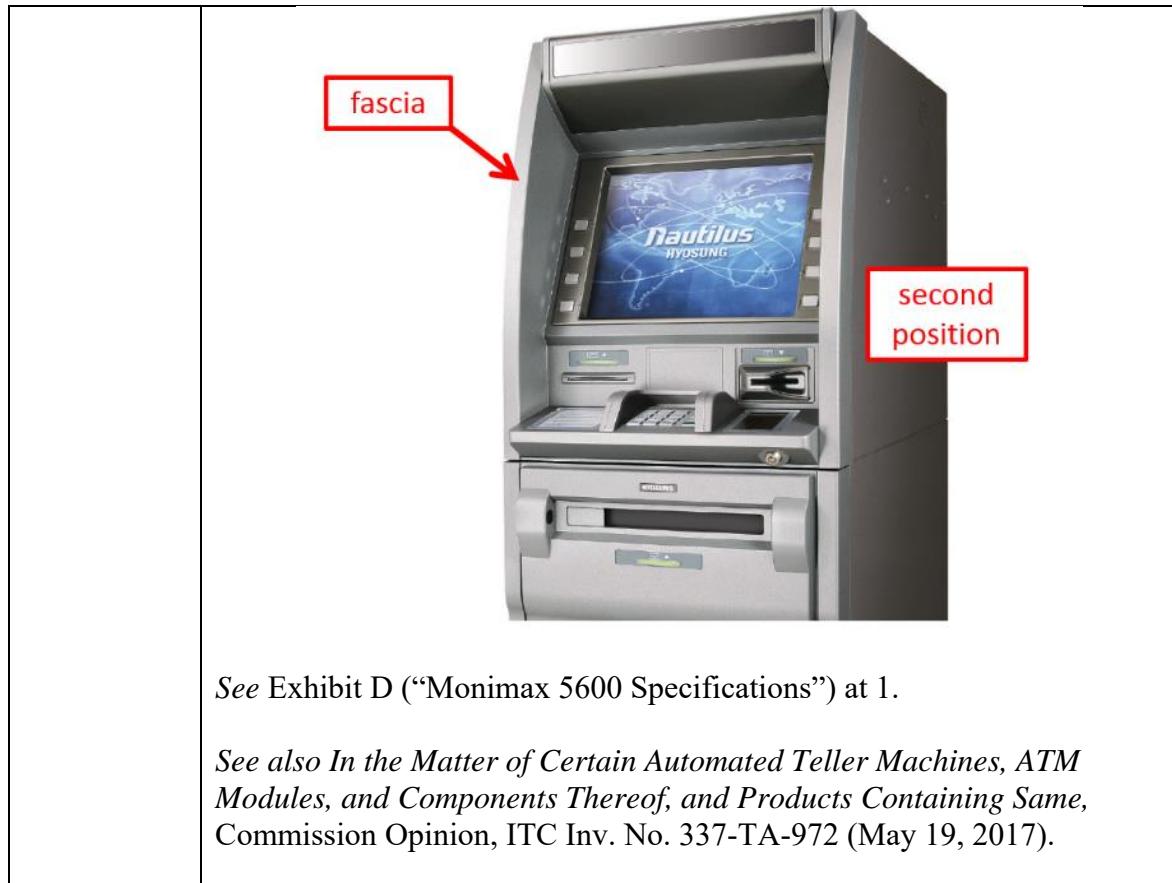


Fig 4.9 The disassembly procedure of EPP module  
See Exhibit F ("Monimax 5600T Maintenance Manual") at 4-22.  
See also *In the Matter of Certain Automated Teller Machines, ATM*

	<i>Modules, and Components Thereof, and Products Containing Same,</i> Commission Opinion, ITC Inv. No. 337-TA-972 (May 19, 2017).
[27f] and wherein the service point is accessible from outside the housing through the service opening when the tray is in the first position;	<p>Hyosung Rollout Tray ATMs include a service point accessible from outside the housing through the service opening when the tray is in the first position, as recited in claim 27. For example:</p> 

	
	<p><i>Certain Automated Teller Machines, ATM Modules, and Components Thereof, and Products Containing Same, ITC Investigation No. 337-TA-972.</i></p>
[27g] a fascia in supporting connection with the tray, and wherein the fascia generally covers the first opening when the tray is in the second position.	Hyosung Rollout Tray ATMs include a fascia in supporting connection with the tray, and wherein the fascia generally covers the first opening when the tray is in the second position, as recited in claim 27. For example: 



# **EXHIBIT D**



## New Branch Solution

*A totally new and innovative solution offering maximum productivity to the branch and productivity, security, and great service to consumers*

### Features

- **Maximum Reliability** - Monimax 5600 is designed to provide 2nd to none reliability in the market with highest uptime and with minimum maintenance needs. You won't have to worry about replacing the parts or sudden breakdowns because the Monimax 5600 is designed to run for a very long time, problem-free.
- **Environment Stewardship** - With quality comes also responsibility. Monimax series are equipped with energy saving features like low energy LCD and long lasting ATM parts with minimum implications to the environment.
- **Flexibility** - Monimax series are designed with open architecture platform allowing for easy future upgrades and module modifications. Modular design is one of ways in which we are trying to save our customers' cost and provide maximum convenience.
- **Ultimate Functionality** - Monimax 5600 offers ultimate functionality featuring bill payment, funds transfer, mobile top-up in a highly user friendly interface for maximum convenience and very easy transition.
- **Maximum Protection** - Complying to standards in various regions worldwide, Nautilus Hyosung offers advanced security measures while highly secured integrity of the Monimax 5600 prevents any attempted security breaches from occurring. Monimax 5600 is also easily integrated with any monitoring solutions to provide seamless data transfer for effective management of the self-service channels.



Innovation at Your Fingertip  
**NAUTILUS HYOSUNG**

### Dependable Customer Service :

We understand the importance of speedy resolution to any issues arising in the operation. Our representatives offer real solutions with real results for maximum return on your investment.



# Monimax 5600

Value delivered



## System Platform

- Microsoft® Window® 7 platform
- NDC+, DDC912, User application

## Communication

- TCP/IP, Wireless, X.25, Dial-up

## Display

- 15" color TFT LCD
- Privacy filter
- Sunlight readable

## Input Type

- 8 function keys
- Touch screen
- PCI compliant EPP
- T-DES, DES, RSA

## Security

- UL 291 Level 1 safe
- Mechanical combination lock
- Electronic lock
- KABA Mas cencon lock
- 1<sup>st</sup> security camera
- 2<sup>nd</sup> security camera
- Fingerprint reader

## Card reader

- Dip hybrid card reader
- Motorized hybrid card reader
- Contactless card reader
- EMV level 1,2 compliant
- Anti-skimming device

## Cash dispenser

- 3,000 notes cassette
- Up to 4 cassettes
- Bundle present
- Bundle retraction
- Note by note rejection
- Automatic shutter

## Printers

- Graphical thermal receipt printer
- Journal printer(Thermal, Dot)

## Additional Features

- VFD(Vacuum fluorescent display)
- Lead-through indicator
- 1D / 2D Barcode reader
- Heater
- Audio jack
- Speaker

## Power Supply

- AC 110~240V, 50~60 Hz
- Backup battery  
(Reserving last transaction & safe shutdown)

## Environmental Conditions

- Temperature  
0°C~40°C (32°F-104°F)  
-31°C~40°C (-24°F-104°F) with heater
- Humidity  
20%~85%

## Dimensions

- Height : 1,505mm(59.3")
- Width : 463mm(18.2")
- Depth : 811mm(31.9")
- All dimensions are cabinet & safe size
- Weight : 444kg(978 lbs)

Internal components may change with the introduction of new technology. Nautilus Hysung reserves the right to change the specification of this ATM to accommodate the changes in technology.



Contact your authorized Nautilus Hyosung distributor or representative for more information.

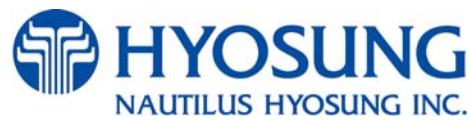


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<http://www.nautilus.hyosung.com>

# **EXHIBIT E**

# **MoniMax 5600**

## **Maintenance Manual**



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## Chapter 1. Overview

## 1.1 Overview

The MoniMax 5600 ATM gives a new look to your customer as a kind of lobby type ATM solution.

This compact, convenient ATM can still be easily installed on your place and operated with an economic cost.

This manual is designed to provide maintenance guide for the MoniMax 5600 ATM and provide detailed description of the following:

- System configuration
- Specification of each unit
- Required parts
- Specifications of expendable parts
- Facility specifications

All information described in this manual is a licensed product of Nautilus Hyosung Corporation.

It is the policy of Nautilus Hyosung Corporation to improve products as new technology, components, software, and firmware become available. Therefore Nautilus Hyosung reserves the right to change specifications without notice.

## 1.2 Basic Features

Important features of the MoniMax 5600 ATM is highlighted in the following list:

- 15 inch TFT LCD
- Keypad (EPP keypad)
- 15.1" privacy filter (Optional)
- Motor Driven Card Reader
  - ISO Track 1, 2, 3 Read
  - EMV Level-1, 2
  - Card Return for power failure
  - Anti-Skimming
  - or Dip type card reader
- Thermal line receipt printer
  - Loading paper semi-automatically
- Electronic journal
  - or Direct Thermal Printing
  - or Dot Impact Printing
- Control Electronic (PC)
- 1D-Barcode Reader (Optional)
- Front access type cash dispenser
  - Automatic shutter type
- UL 291 Level-1 Safety
  - or UL 291 Business Hour Safety
- Electronic and Key Lock
  - or Dial and Key Lock
  - or Cencon and Key Lock
- Supporting USB Still Camera 1,2
- Supporting Audio guidance by sound (Optional)

## 1.3 Terminologies

- ◆ CE : Control Electronics
- ◆ PNC : Panel Control Board
- ◆ MCU : Magnetic Card Reader Unit
- ◆ VFD : Vacuum Fluorescent Display
- ◆ SPR : Slip Printer (=Receipt Printer)
- ◆ JPR : Journal Printer
- ◆ CDU : Cash Dispenser Unit
- ◆ P/S : Power Supply
- ◆ OPL : Operation Panel and Handling Screen for Customer
- ◆ SPL : Service Panel and Handling Screen for Operator  
(=Enhanced Rear Operator Panel)
- ◆ IDC : Identification Card Device
- ◆ PTR : Printer (mainly Receipt Printer)
- ◆ PIN : Encryption Pin Pad
- ◆ SIU : Sensor and Indications Unit
- ◆ TTU : Text Terminal Unit (OPL or SPL)
- ◆ CAM : Camera Unit
- ◆ ADA : The Americans with Disabilities Act
- ◆ EMV : Europay, Mastercard, Visa
- ◆ VDM : Vendor Dependent Mode
- ◆ BATT : Battery
- ◆ Earphone Jack : Voice Converter for Visually Disabled Persons

## **Chapter 2. Precautions for Safety**

## 2.1 Overview

### Common Precaution for Safety



Precautions outlined this manual provide information on safe and proper handling of the product. Non-compliance of the precautions may result in injury or damage to the product. This precaution symbol with sample term tells you safety warnings during equipment handlings.

Please read the following instructions before operating equipment.

- Operate equipment in the order outlined in this manual.
- Follow precautions indicated in this manual, as well as the equipment itself.
- Failure to properly address these precautions may lead to injury or damage to the product.
- Avoid operations not addressed in this manual.
- If you cannot remedy system problems using the methods outlined in this manual, please refer to contact information listed in the manual.

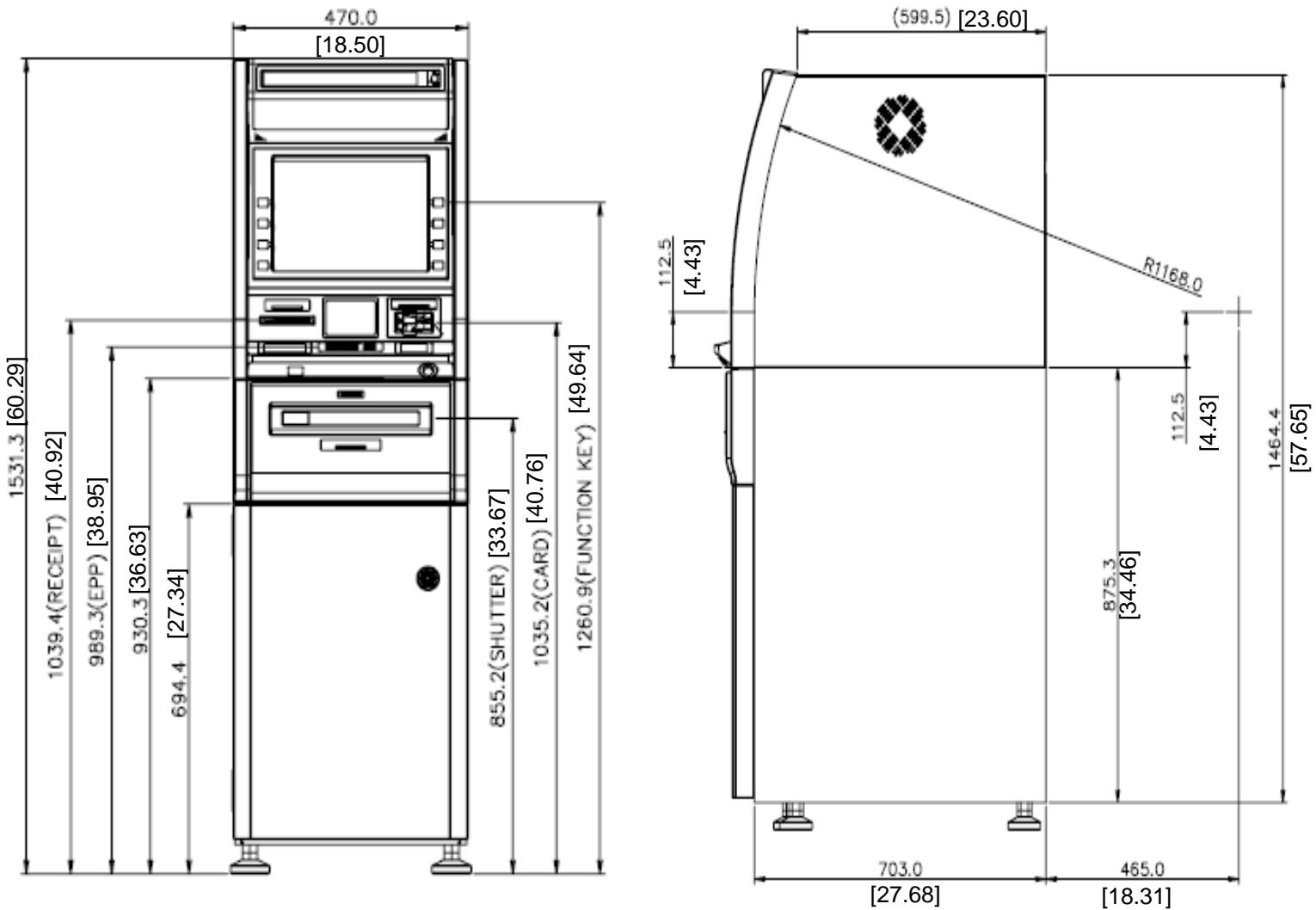
## 2.2 Description of Precaution Symbols

SYMBOL	DESCRIPTION
	<p>Electrical Shock</p> <ul style="list-style-type: none"> <li>• Do not remove cover. Only a maintenance engineer is allowed to open the cover.</li> <li>• Do not touch. You may receive electric shock.</li> <li>• Make sure to turn off the power when servicing the equipment.</li> </ul>
	<p>High Temperature</p> <ul style="list-style-type: none"> <li>• Do not touch the equipment when it is running.</li> <li>• The equipment can get extremely hot and may cause a burn.</li> <li>• Make sure to close the cover before running the equipment.</li> </ul>
	<p>Be Careful when Moving</p> <ul style="list-style-type: none"> <li>• The equipment is heavy. Make sure at least 2 people to lift or move the equipment.</li> <li>• Do not attempt to move the equipment alone. You may be injured by dropping the heavy equipment.</li> </ul>
	<p>Fire Hazard</p> <ul style="list-style-type: none"> <li>• Place the equipment in an area away from any combustible materials.</li> <li>• The equipment may catch on fire from overheating or short circuit of the power supply unit.</li> </ul>
	<p>Disassembly</p> <ul style="list-style-type: none"> <li>• Do not disassemble or modify the equipment unless you are a certified engineer.</li> <li>• Contact the service center for maintenance, adjustments and repairs.</li> <li>• Improper disassembly may cause fire or electrical shock.</li> </ul>
	<p>Fall down</p> <ul style="list-style-type: none"> <li>• Do not place the equipment where the floor cannot sustain the weight of the equipment, or on slanted or unstable surface.</li> <li>• Equipment may fall down and cause injury or damage.</li> </ul>
	<p>Unplug the Equipment</p> <ul style="list-style-type: none"> <li>• Stop using the equipment immediately if it smokes, emits an unusual smell, makes abnormal sounds, or if liquids or other foreign materials enter the equipment.</li> <li>• If the above-mentioned abnormalities occur, immediately turn off the power, unplug the equipment and contact the service center.</li> <li>• If you ignore these symptoms, the equipment may catch on fire or cause electric shock.</li> </ul>

## **Chapter 3. System Configuration**

### 3.1 External Appearance

#### 3.1.1 Dimensions

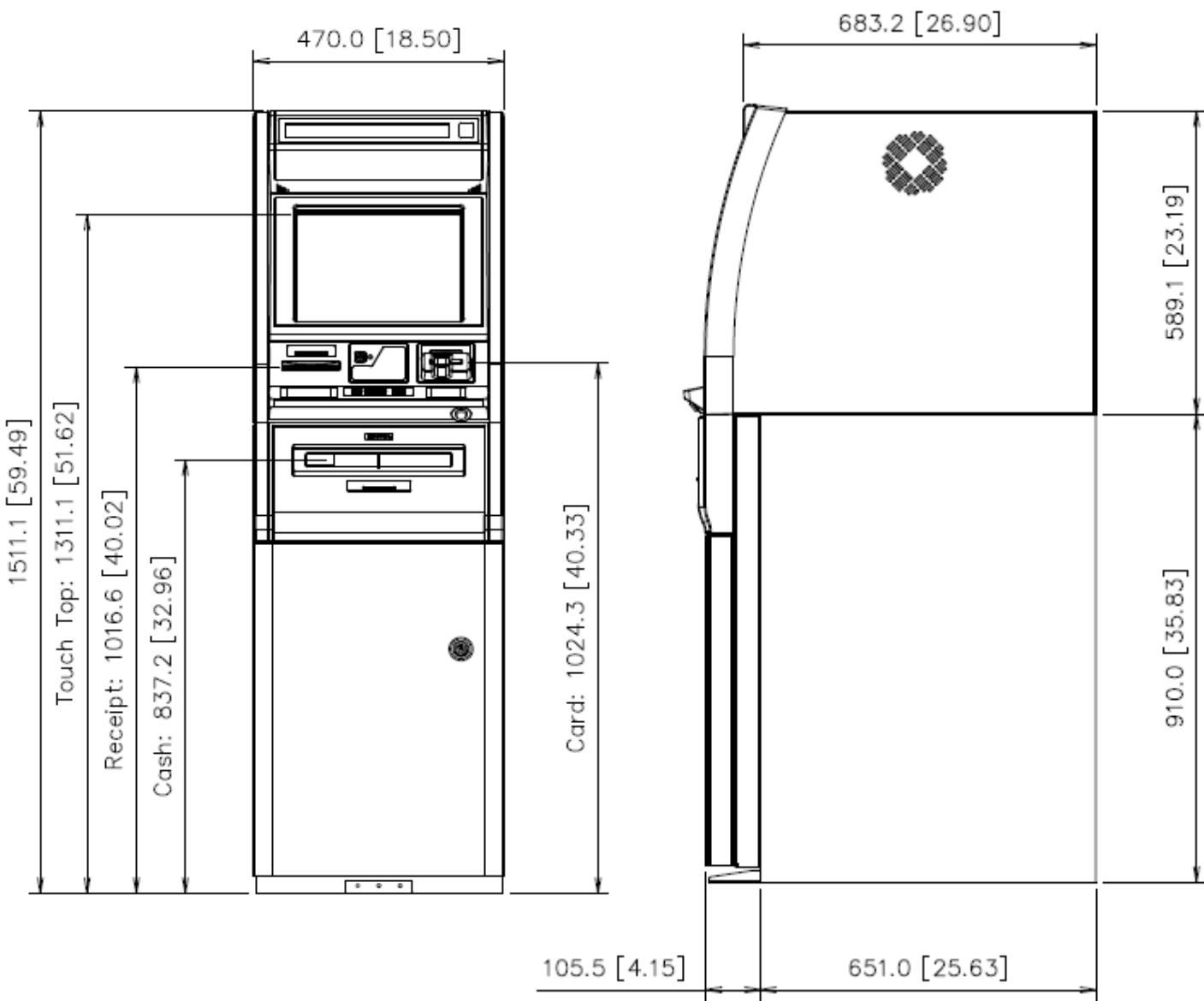


Note : All the unit in the dimension is millimeter and [ ] is inch scale..

Fig. 3.1 Dimensions : Level-1 Type

MoniMax 5600

### **3. System Configuration**



Note : All the unit in the dimension is millimeter and [ ] is inch scale.

Fig. 3.2 Dimensions :Business Type

### 3.1.2 Component Name

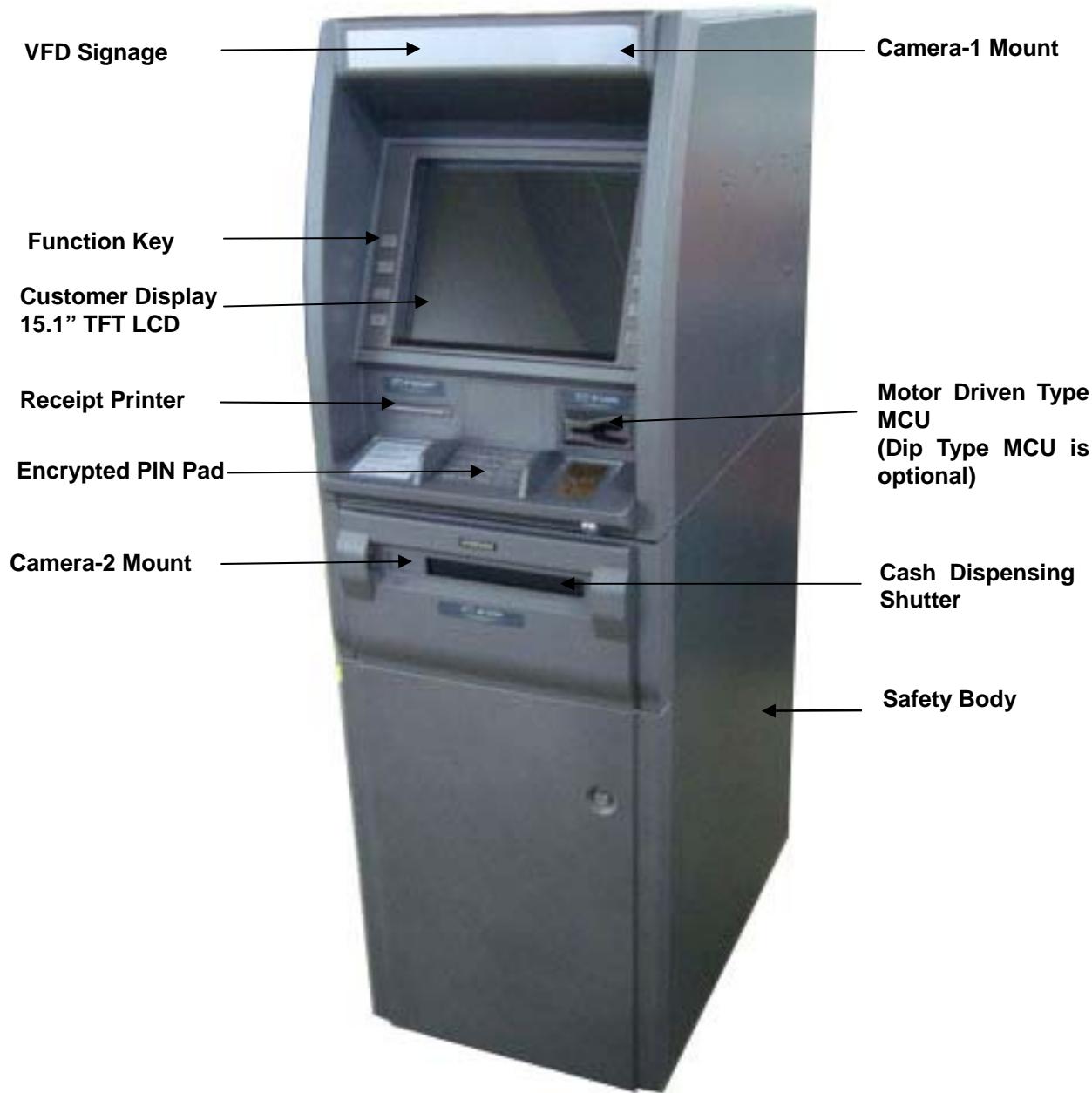


Fig. 3.3 Component Location of MoniMax 5600

MoniMax 5600

3. System Configuration

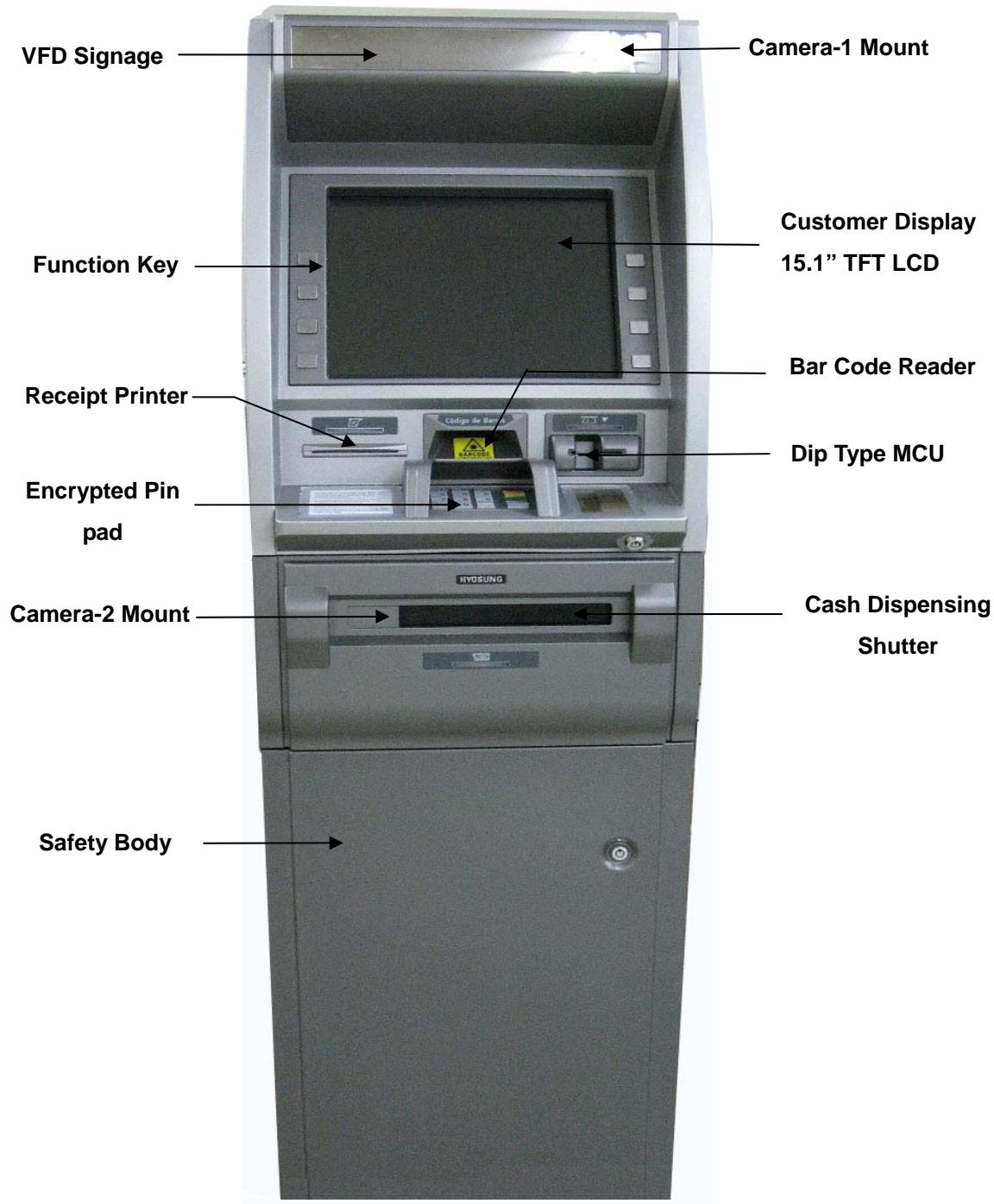


Fig. 3.4 Component Location of MoniMax 5600 with Barcode Reader

## **Chapter 4. User Handling Unit**

## 4.1. Overview

Basically, the user handling unit is composed of the pin pad that the customers manipulate by themselves, monitor, camera, speakers and associated electronic boards.

### 4.1.1 Component location

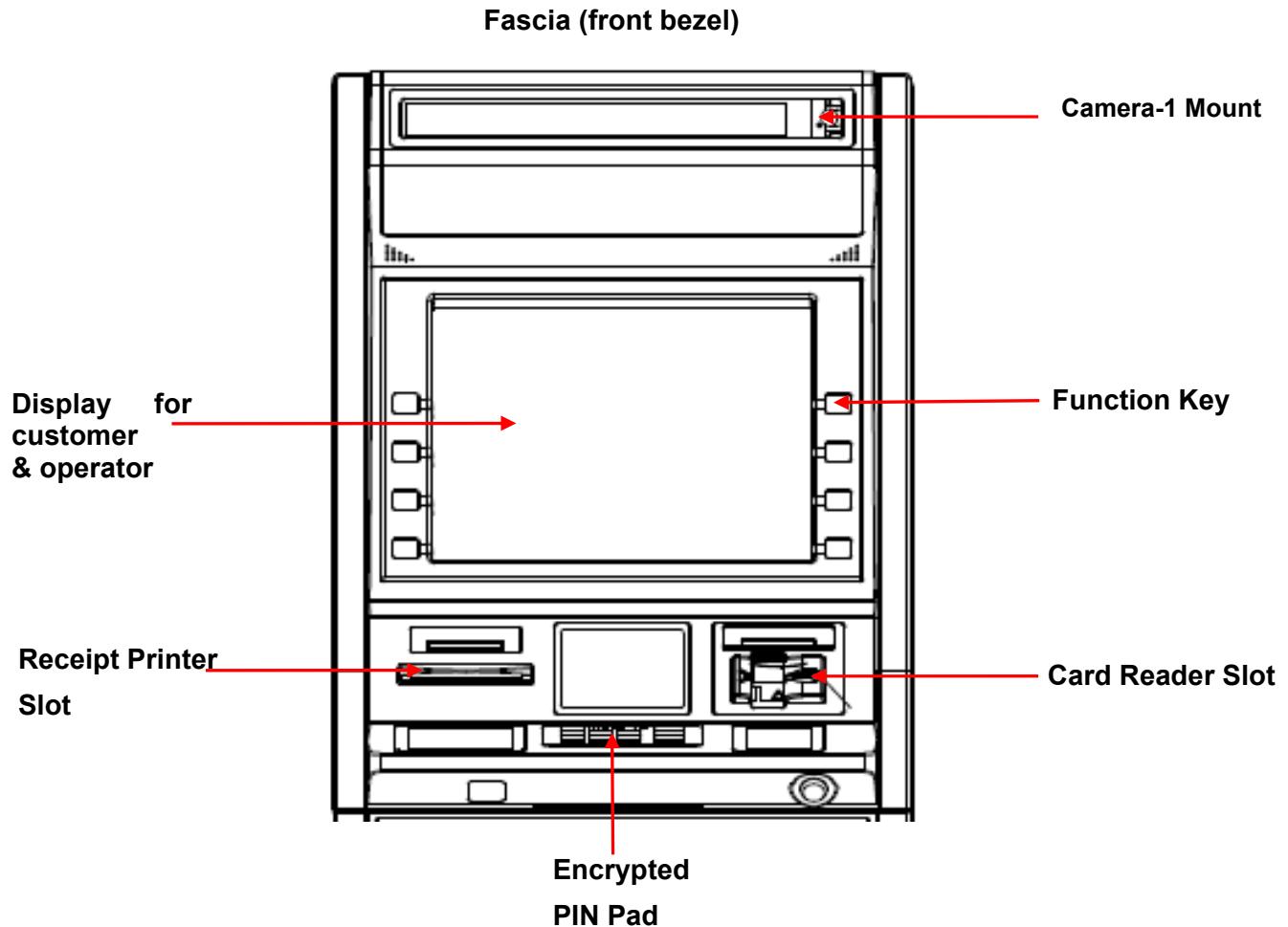


Fig 4.1 The front view of User Handling Unit

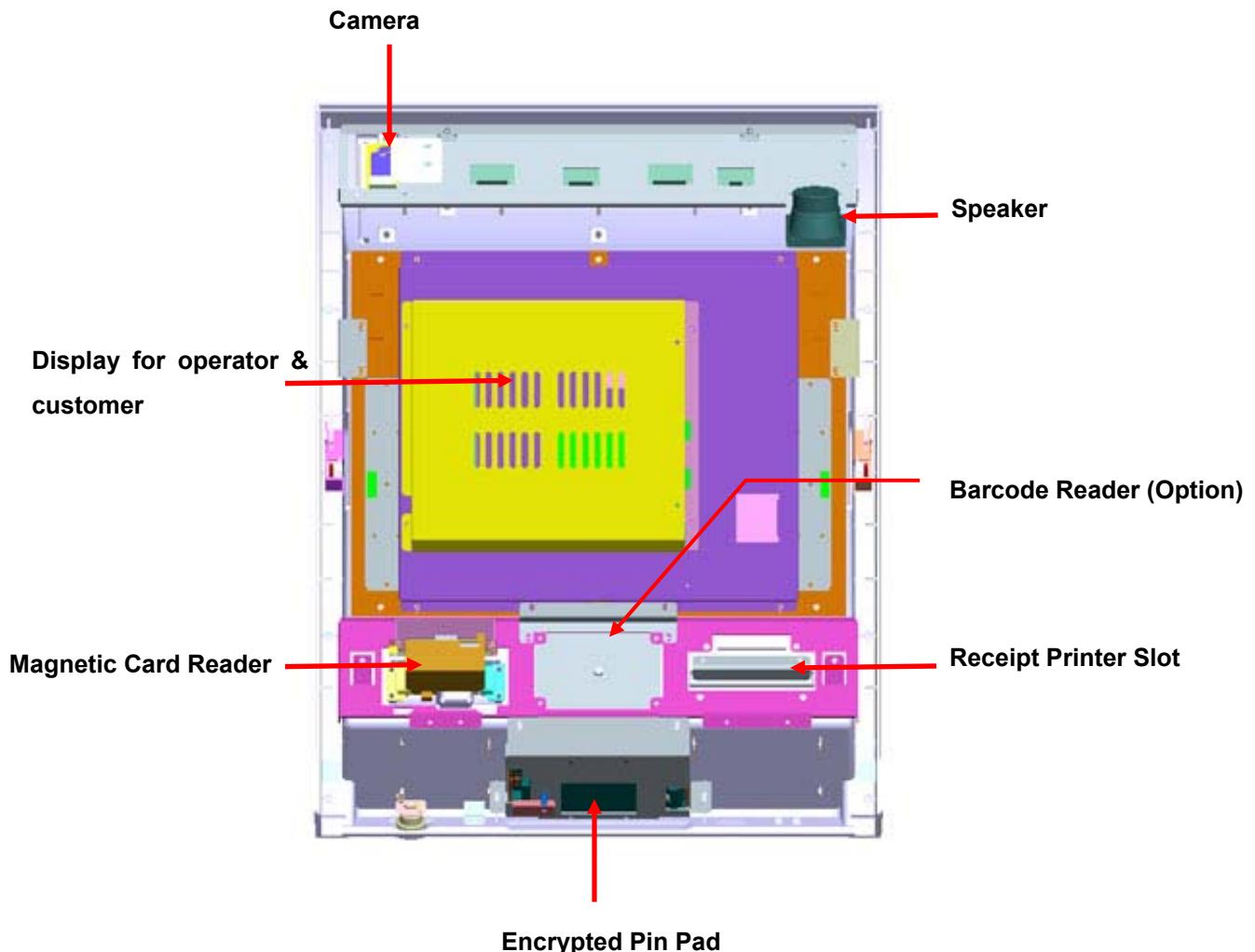
**MoniMax 5600****4. User Handling Unit**

Fig 4.2 The back view of User Handling Unit

UNIT	ITEM	SPECIFICATIONS
Display Unit	Display size and display method	15.1 inch TFT LCD
	Resolution	1024X 768 pixels (XGA)
	Supported colors	16.2 millions colors
Input Device Unit	Function Key	Support
	Operation key	16 Key
Additional function	Audio guidance	Sound (On board, Option)

Table 4.1 Specification of User Handling Panel Unit

## 4.2 Monitor

A monitor is composed of privacy display filter, protective glass, LCD, DC/DC converter, analog board, inverter and On Screen Display (OSD) board as shown in the figure below.

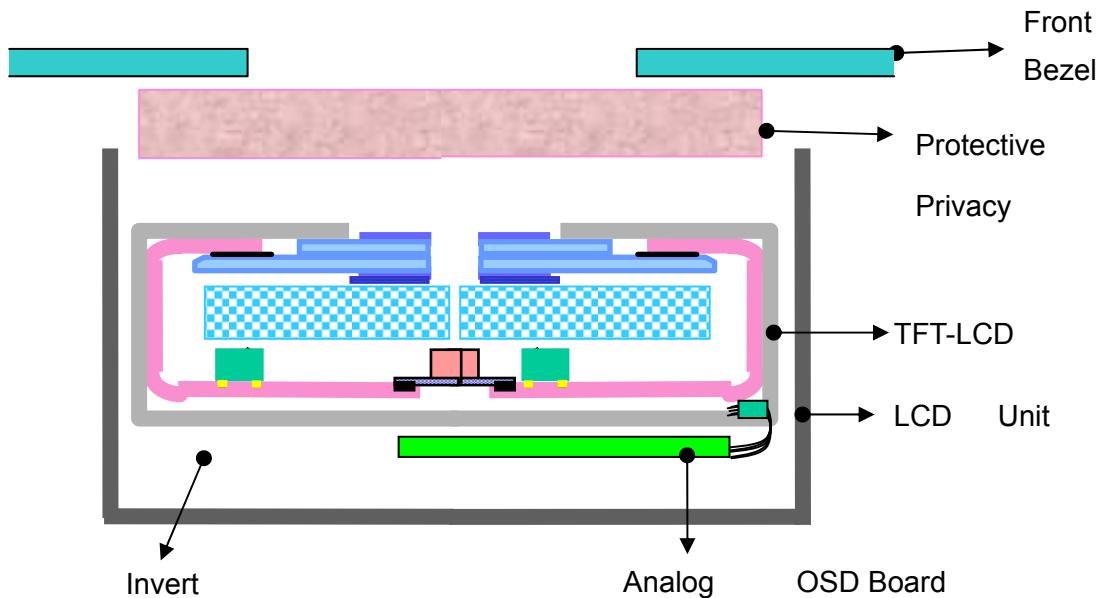


Fig 4.3 The schematic diagram of Liquid Crystal Display

### 4.2.1 TFT Color LCD

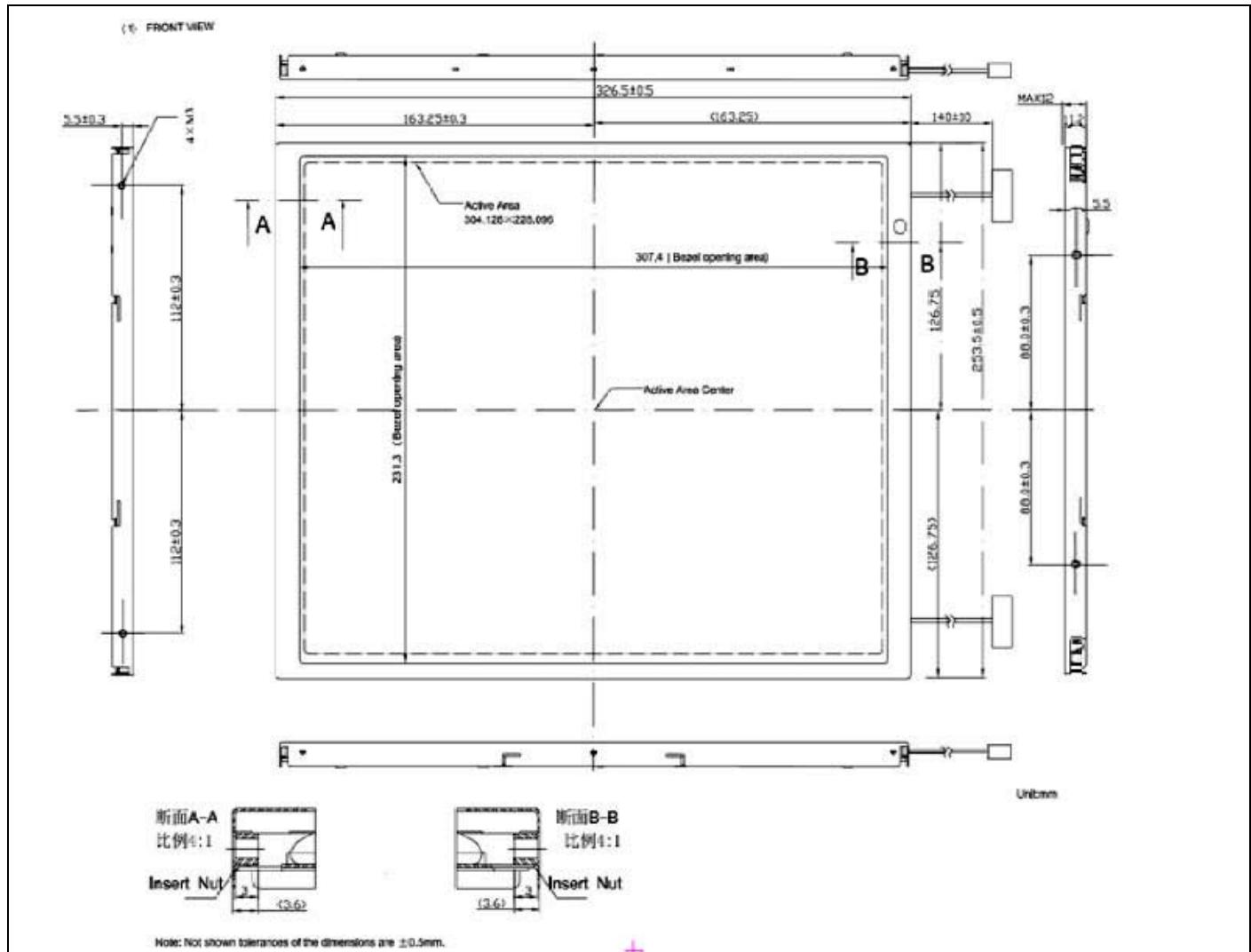
#### 4.2.1.1 Characteristics

The following items are neither defects nor failures.

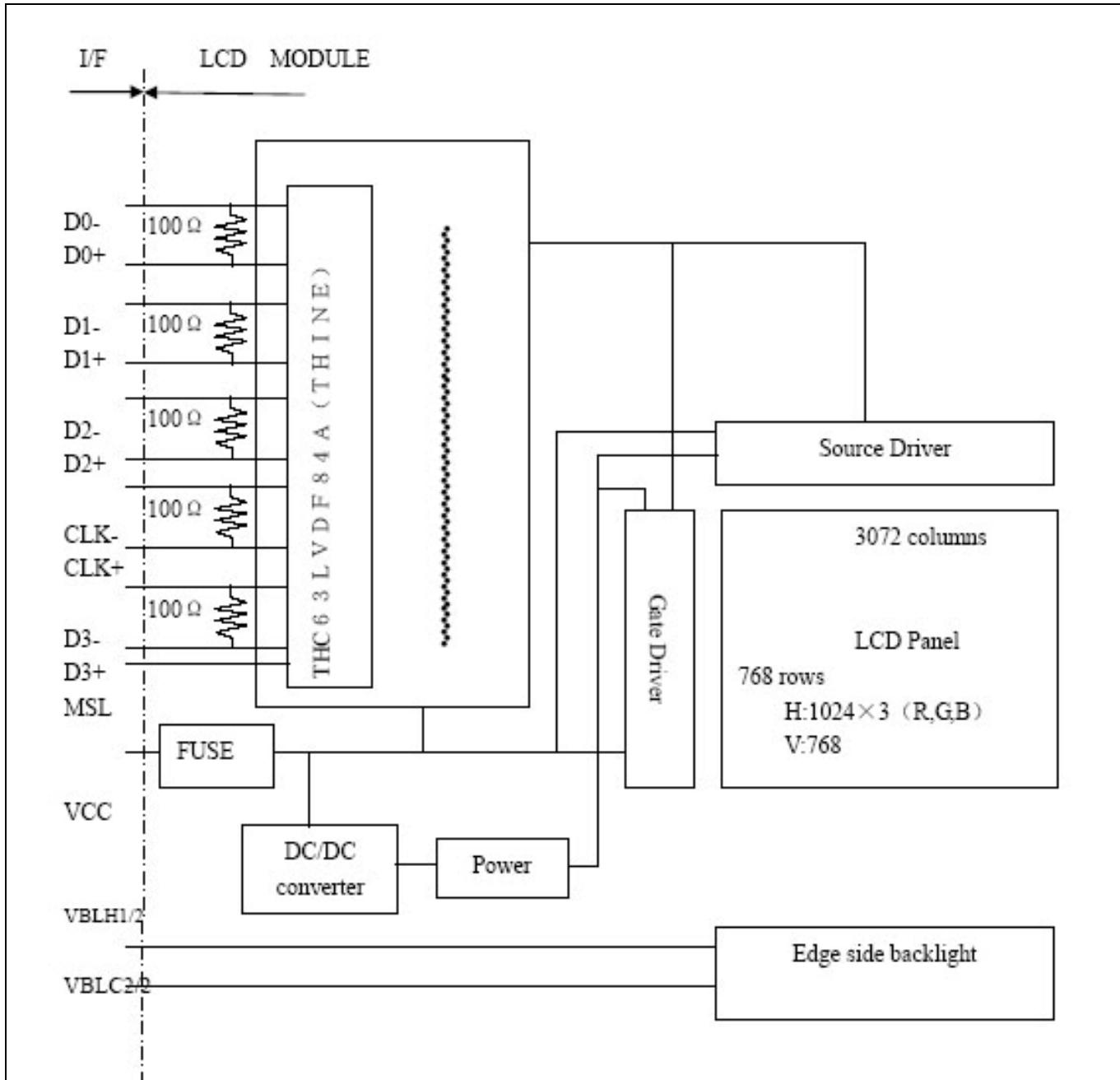
- Response time, luminance and color may be changed by ambient temperature.
- The LCD may be seemed luminance non-uniformity, flicker, vertical seam or small spot by display patterns.
- Optical characteristics (e.g. luminance, display uniformity, etc.) gradually is going to change depending on operating time, and especially low temperature, because the LCD has cold cathode fluorescent lamps.
- Do not display the fixed pattern for a long time because it may cause image sticking. Use a screen saver, if the fixed pattern is displayed on the screen.
- The display color may be changed by viewing angle because of the use of condenser sheet in the backlight.
- Optical characteristics may be changed by input signal timings.

**MoniMax 5600****4. User Handling Unit**

- The interference noise of input signal frequency for this product and luminance control frequency of customer's backlight inverter may appear on a display. Set up luminance control frequency of backlight inverter so that the interference noise does not appear.

**4.2.1.2 Outside Drawing of LCD: Front**

## 4.2.1.3 LCD Block Diagram



**Note 1 :** Connection between GND, FG (Frame ground) and VBLC (Lamp low voltage terminal) in the product.

GND-FG	Connected
GND-VBLC	Not connected
FG-VBLC	Not connected

**Note 2 :** These grounds should be connected together in customer equipment.

**4.2.1.4 General Specifications of LCD**

<b>Display area</b>	304.128 (W) x 228.096 (H) mm (typ.)
<b>Diagonal size of display</b>	38.0 cm (15.0 inches)
<b>Drive system</b>	a-Si TFT active matrix
<b>Display color</b>	16,777,216 colors (6bit+FRC)
<b>Pixel</b>	1,024 (H) x 768 (V) pixels
<b>Pixel arrangement</b>	RGB (Red dot, Green dot, Blue dot) vertical stripe
<b>Dot pitch</b>	0.099 (W) x 0.297 (H) mm
<b>Pixel pitch</b>	0.297 (W) x 0.297 (H) mm
<b>Module size</b>	326.50 (W) x 253.5 (H) x 11.2 (D) mm (typ.)
<b>Weight</b>	1000 g (typ.)
<b>Contrast ratio</b>	450:1 (typ.)
<b>Viewing angle</b>	<ul style="list-style-type: none"> <li>• Horizontal : 120° (typ.)</li> <li>• Vertical : 100° (typ.)</li> </ul>
<b>Designed viewing direction</b>	<ul style="list-style-type: none"> <li>• Viewing angle with optimum grayscale : normal axis</li> </ul>
<b>Color gamut</b>	At LCD panel center 60% (typ.) [against NTSC color space]
<b>Response time</b>	Ton (white 90% → black 10%) + Tpff (black 10 % → white 90 %) 16 ms (typ.)
<b>Luminance</b>	At IBL = 7.5mArms/lamp 250cd/m <sup>2</sup> (typ.)
<b>Signal system</b>	LVDS 1 port [RGB : 8-bit, Dot clock (CLK), Data enable (DE)]
<b>Power supply voltage</b>	LCD panel signal processing board : 3.3V
<b>Backlight</b>	Edge light type : 2 cold cathode fluorescent lamps - Replaceable part • Lamp holder set : Type No. 150LHS21
<b>Power consumption</b>	At IBL=7.5mArms/lamp and checkered flag pattern 9.5W (typ.)
<b>Mechanical Specifications</b>	Module size $326.5 \pm 0.5(W) \times 253.5 \pm 0.5(H) \times 11.2 \pm 0.5(D)$
	Display area      304.128 (W) x 228.096 (H)
	Weight      1000 (typ.)

#### 4.2.1.5 Disassembling the LCD assembly

- 1) Insert the key and turn it clockwise.
- 2) Pull the front panel outward.
- 3) Turn off the power



Fig 4.4 The disassembly procedure of LCD (#1)

- 4) Unscrew two fixing screws located on front panel's each side and pull the front panel in the arrow direction
- 5) Remove the screw and connector to separate the board cover.
- 6) To disassemble LCD, just remove screws and connectors.



Fig 4.4 The disassembly procedure of LCD (#2)

- 7) Assemble the LCD unit using the reverse order of disassembly.

#### 4.2.2 General Precautions

##### 1) Handling

- When the module is assembled, it should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.
- Refraining from strong mechanical shock and/or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFT back-light
- Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur
- When this module is disassembled from the front panel and is tried to assemble again, you should check the condition of surface. If the surface of the polarizer is dirty by the foreign things, dusts, fingerprint, clean it using some absorbent cotton or soft cloth
- The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials (ex.Acetone), Ethyl alcohol, Toluence, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap
- Protect the module from static, it may cause damage to the C-MOS Gage Array IC
- Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process
- Do not adjust the variable resistor which is located on the back side.
- Pins of I/F connector shall not be touched directly with bare hands.

##### 2) Storage

- Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35°C and relative humidity of less than 70%
- Do not store the TFT-LCD module in direct sunlight
- The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store

**MoniMax 5600**

**4. User Handling Unit**

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**3) Operation**

- Do not connect, disconnect the module in the “Power On” condition.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufactures. Grounding and shielding methods may be important to minimize the interference.

**4) Others**

- Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- If the module displays the same pattern continuously for a long period of time, it can be the situation when the image “stick” to the screen

### 4.2.3 Troubleshooting Procedure

#### 4.2.3.1 The screen is blank.

- 1) "No signal" message is displayed on the LCD.
  - > Check whether the DVI cable is properly connected to OPL Assy or VGA card.
  - > Check if the main board is in hang-up state or powered off.
  - > Check if the display setting of the VGA card is active (using SPL.)
    - \* If the system was booted with the video cable (DVI or RGB) being disconnected, reconnecting the cable may not solve the problem.
- Tip) CTRL+ALT+F1: Activates DVI display.

#### 4.2.3.2 The LCD is black.

- 1) Backlight of the LCD panel is off.
  - > Check the power cable connection status of OPL assembly. (Check +24V input.)
  - > Check the LED color of the OSD board.
    - LED OFF: The AD board is in off state. Press OSD Power On/Off button.
    - Green ON: The AD board is in normal state.
- \*Check or replace the inverter cable or inverter board.
  - > If the trouble persists, replace the AD board.
  - > If the trouble persists even after the AD board is replaced, replace the LCD assembly.
- 2) Backlight of the LCD panel is on.
  - > Connect/Disconnect the power line of OPL assembly.
  - > If "Nautilus HYOSUNG" logo is not displayed on the OPL screen, replace the AD board.

#### 4.2.3.3 The LCD is displayed white.

- > Check the installation status of the LVDS cable inside the assembly.
- > If the trouble persists even when the installation status is normal, replace the cable.
- > If the trouble persists even after the cable is replaced, replace the AD board.
- > IF the trouble persists even after the AD board is replaced, replace OPL assy.

#### 4.2.3.4 When the screen is in red or other colors (when the color display is normal)

- > Check the connection status of the video cable. (Connect again.)
- > Check whether the video cable has not been damaged using spare video cable.
- > Check the connection status of the LVDS cable. (Connect again.)
- > If the trouble persists, replace the LVDS cable.
- > If the trouble persists even after LVDS cable is replaced, replace the AD board.

#### 4.2.3.5 The screen does not provide visible display.

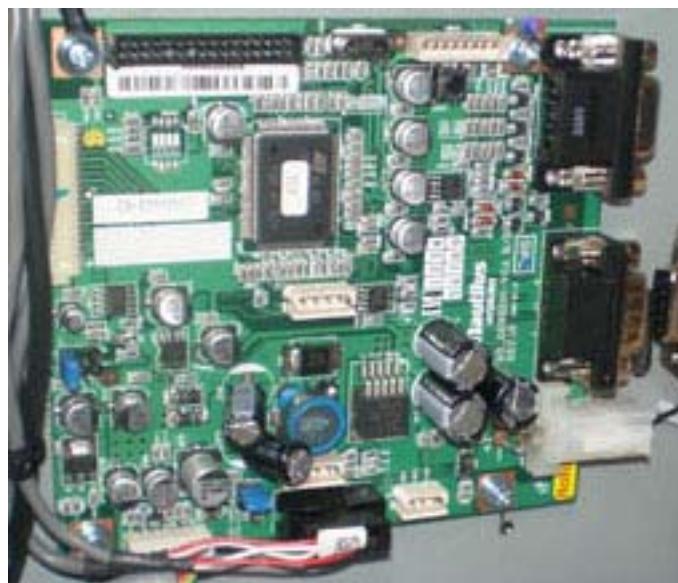
- > Replace the LVDS cable.
- > If the trouble persists, replace the AD board.

- Inverter



- AD Board

AD board is on the rear of LCD. This board is disassembled from LCD by removing all screws and connectors.



## 4.3 Panel Control Board

### 4.3.1 Specification

#### 4.3.1.1 Basic Specifications

ITEM	SPECIFICATIONS	REMARKS
CPU	AT89S52 (8051 Compatible)	-
Serial Communication	RS-232 1 Port	-
Function Key Input	4 X 2 Support	-
Flicker supported	8EA (MCU,EDU,CDU,SPR, Reserved)	-
Sensor supported	8EA (Door Sensor(Safe door and Front door))	-
Power Interface	System Power Sequence Support	-

#### 4.3.1.2 Communication Interface Specification

- Uses the RS-232 at the speed of 9600bps.

#### 4.3.1.3 Power Interface Specification

- 24V single output is the basic power supply. Pin 1&2 has 24V, while Pin 3 &4 has GND. The power inside the Control Board is 24V and it uses 12V, 5V, and 3.3V. The voltage for Card Reader/LCD is 12V, while 5V is the power supply for PIN PAD.

## 4.3.2 H/W Block Diagram

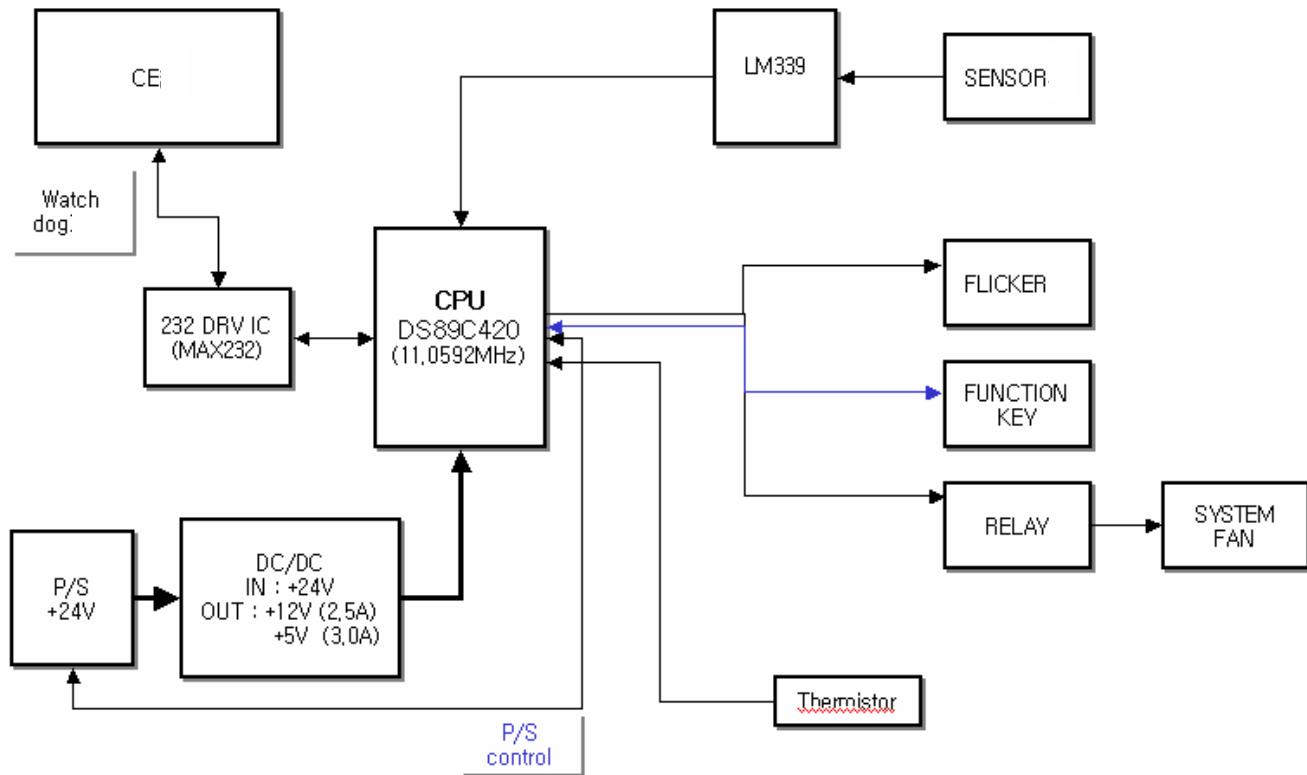


Fig 4.5 H/W Block Diagram

#### 4.3.3 PCB Silk Diagram

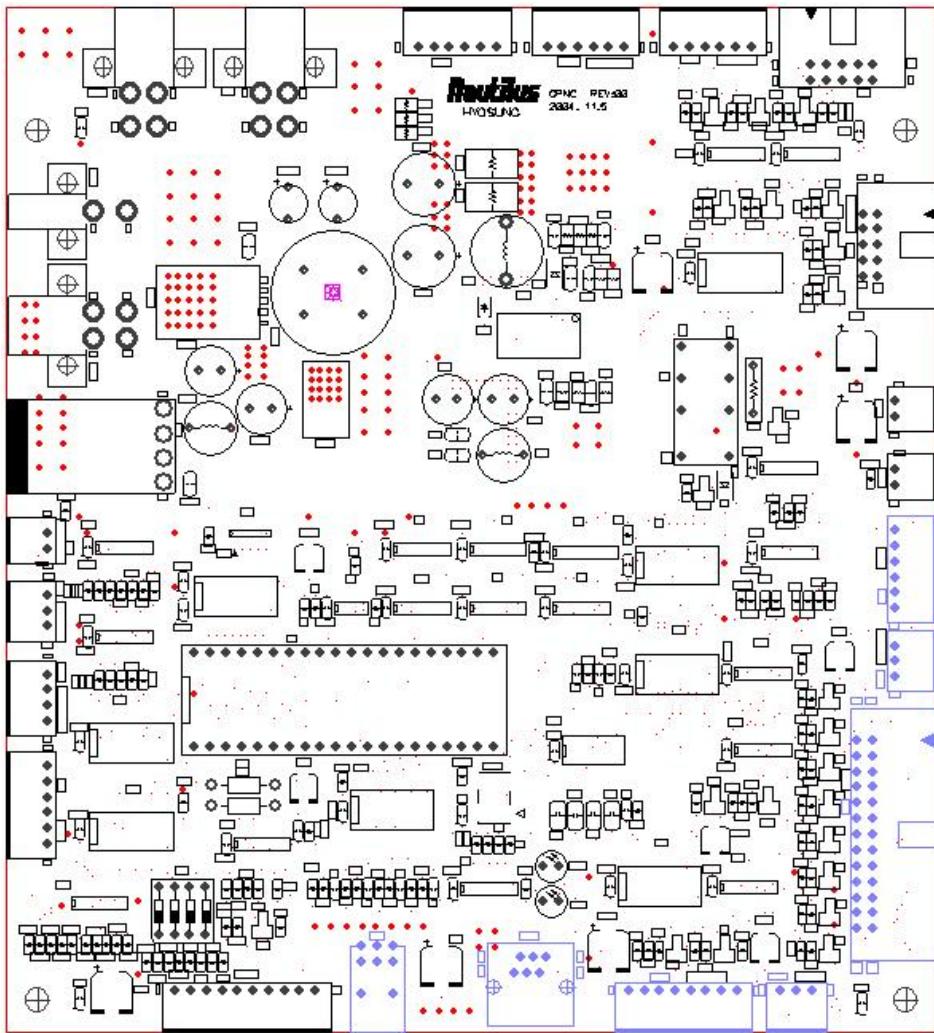


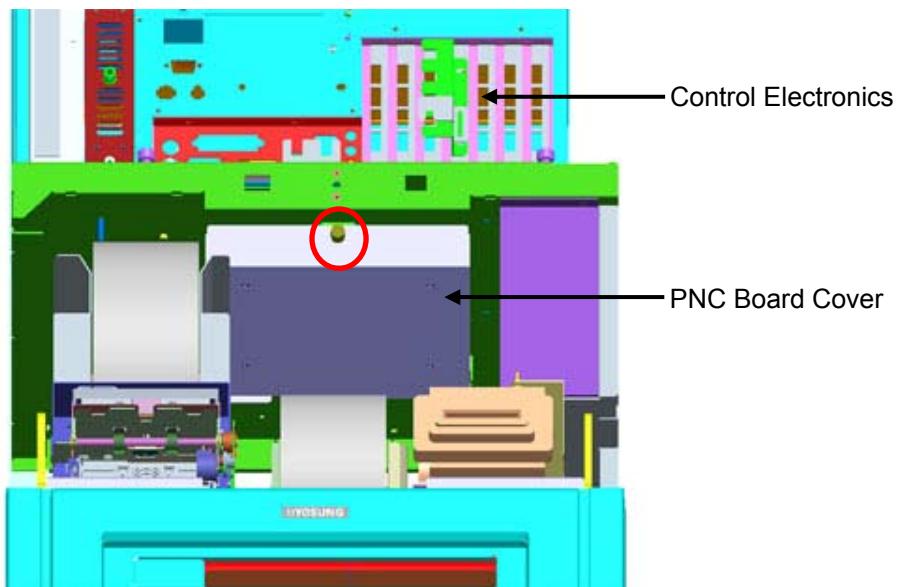
Fig 4.6 PCB Silk Diagram

#### 4.3.4 Connector Interface

- 1) CN1(6Pin, P/N : 33300906) : Lift Function Key
- 2) CN2(6Pin, P/N : 33300906) : Right Function Key
- 3) CN3(26Pin, P/N : 33301326) : Flicker, CDU, SHU, DOOR SENSOR INPUT
- 4) CN4(4Pin, P/N : 33311904) : +12V, +5V Power OUTPUT
- 5) CN5(4Pin, P/N : 33316604) : +24V Power INPUT
- 6) CN6, CN7(10Pin, P/N : 33301310) : Touch Screen
- 7) CN8(3Pin, P/N : 33300903) : Reserved Power
- 8) CN9(2Pin, P/N : 33300902) : MOD S/W
- 9) CN10(6Pin P/N : 33408506) : PNC ↔ CE I/F
- 10) CN11(8Pin, P/N : 33300908) : Power Supply Control
- 11) CN12(3Pin, P/N : 33300903) : Power Switch
- 12) CN13(3Pin, P/N : 33300903) : NVRAM clear
- 13) CN14(4Pin, P/N : 33300904) : ADA Detect Sense
- 14) CN15(6Pin P/N : 33300906) : LED Indicator(IN SERVICE, SUPERVISOR, ERROR, Reserved)
- 15) CN16(2Pin, P/N : 33300902) : ON USE LED
- 16) CN17(2Pin, 3330000004 ) : +24V FAN Control
- 17) CN18(6Pin, P/N : 33300906) : LED Indicator (COMMUNICATION+2 Reserved)
- 18) CN19(2Pin, P/N : 33300902) : Reset Switch
- 19) CN20(4Pin, P/N : 33311904) : +12V, +5V Power OUTPUT
- 20) CN21(4Pin, P/N : 33311904) : +24V, +5V Power OUTPU
- 21) CN22(6Pin, P/N : 33300906) : RESERVED RELAY
- 22) CN25(10Pin, P/N : 33301310) : RESERVED\_SENS\_IN

#### 4.3.5 Disassembly Procedure of PNC board

- 1) Insert the key on the front door and turn it clockwise.
- 2) Open the front door by pulling it outward and turn power off.
- 3) Pull out the button of the PNC board cover as shown in below picture.
- 4) Remove all screws and cables connected to the board to disassemble the PNC board.



- 5) Use the reverse order of the disassembly to assemble the unit.

#### 4.4 Encrypted PIN Pad

EPP(Encrypted PIN Pad) is a device that encrypts sensitive data such as customers' card information and passwords, which requires the highest level of security, and transmits it to the Host. Therefore, if EPP problem occurs in the field, verify the problem and replace the entire unit. You cannot disassemble the internal components or replace them individually.

The following figure is the back of the EPP. The functions and roles of each part are summarized as below.

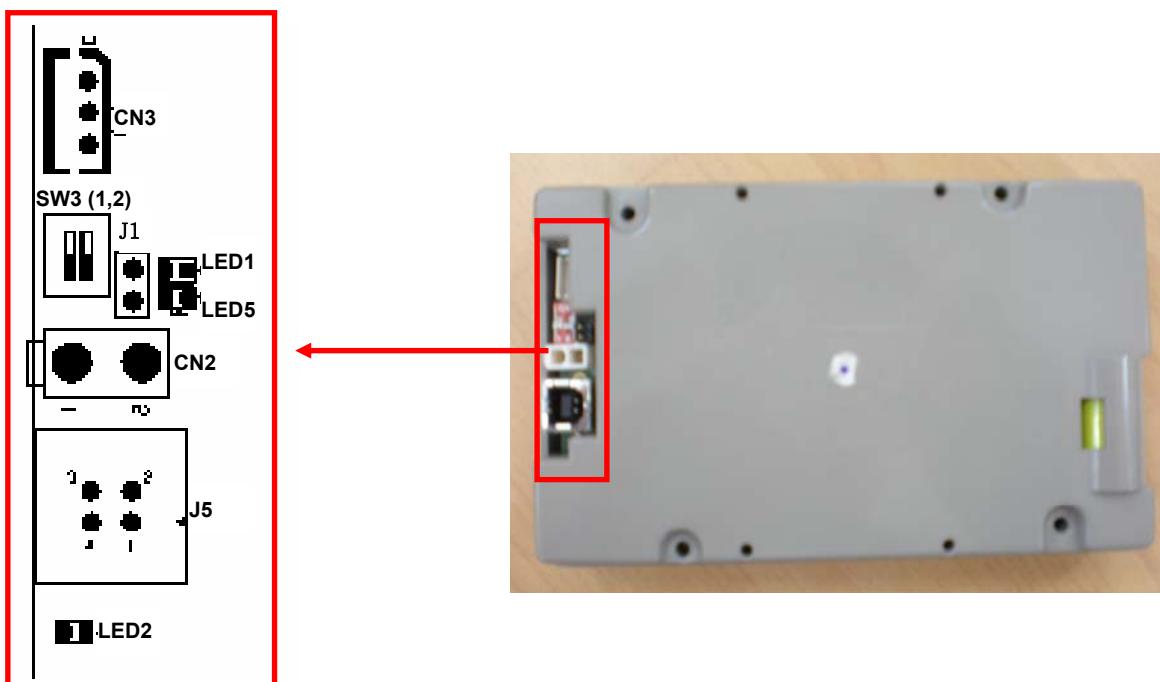


Fig 4.7 Back of EPP

NO	LABELING	DEFAULT SETTING	DESCRIPTION	REMARK
1	CN2	-	Power connector(5V)	
2	CN3	-	Firmware downloading connector	
3	SW3(1,2)	OFF	NV-RAM is clear when No.1 switch is turned ON	Due to security issues, no repair is possible in the field
		OFF	Fuse is open when No.2 switch is turned ON and at the same time J1 is short	
4	J1	Open	Used for downloading the Firmware or turning off the fuse for security reason.	
5	J5	-	USB communication connector	

#### 4.4.1 Common Occurred Problem List

- ① In case the EPP cover is detached-- to whatever extent-- due to a mistake made by an operator or the maintenance personnel
- ② In case there is a damage caused by any external shock or static electricity
- ③ In case the EPP is not connected with an earth cable, which makes it vulnerable to static electricity
- ④ In case the battery is discharged.

#### 4.4.2 LED Operation Check

There are 3 LEDs at the back of the EPP. With the status of these 3 LEDs, the EPP operation condition can be easily checked..

NO	LED	DESCRIPTION	REMARK
1	LED1 (Power LED)	Whether the power supply is in "normal" status (If it is normal, red light will be turned on LED)	
2	LED2 (Status LED)	Whether the EPP is in "normal" operation (If it is normal, LED will blink)	
3	LED5 (NV-RAM LED)	Whether the NV-RAM is properly cleared (If it is normal, red light will turned on LED)	

#### 4.4.3 Troubleshooting

- Since the problem in this unit involves a security issue, you should replace the entire unit when encountering a problem.
- If a problem is confirmed, turn off the power, remove the power cable and bracket, and then replace the unit with a new one. For the assembly of the unit, follow the reverse order.

- ① If LED1 is off, check the cable connection to see if the power supply is okay.
- ② If LED1 is on and LED2 is off, it means EPP is in abnormal operation. Therefore, replace the EPP.

#### 4.4.4 Disassembling the EPP module

- 1) Insert the key on the front door and turn it clockwise.
- 2) Open the front door by pulling it out and turn power off.
- 3) Remove 2 screws on both sides of the front door and then pull the front outward.



- 4) Remove the screws and connectors to disassemble the EPP.

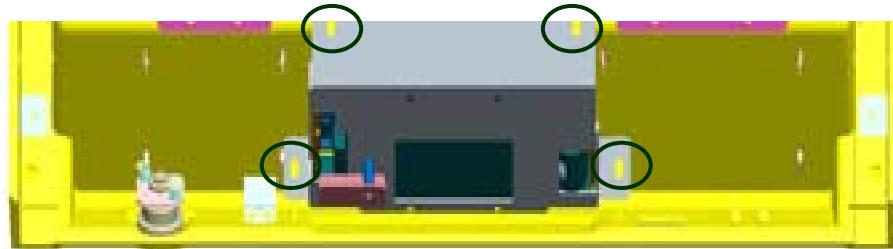


Fig 4.8 The disassembly procedure of EPP module

- 5) Do NOT attempt to DISASSEMBLE further for security. Doing so may cause data loss.
- 6) Please use the reverse order to assemble it again.

## 4.5 Analogue Digital Board

### Specifications

Resolution : 720\*400, 640\*480, 800\*600, 1024\*768 Mode (14.1": Supporting 1280\*800)

Supporting 1CH 8bit LVDS

Supporting 1CH 6bit LVDS

Supporting 18bit TTL

Comply with VESA DDC1 & DDC2 Standards & VESA DPMS Standard

Supporting 1 Language OSD

Supporting Minato Touch Screen Interface

### Hard Ware Specification

#### [1] Basic Specification

1) MainChip (CPU/Scaler One Chip)

- Processor : High Performance X86 MCU

- Clock Input : 14.318MHz

- OSD (On Screen Display) Control : Using **CN301 Con**

- LCD Panel ON/OFF : Using **OSD Menu and Door Sensor**

- LCD Panel Brightness Control : Using **OSD Menu**

- F/W Download Function : Using **CN302 (RS-232 I/F B/D is required.)**

- LVDS/TTL Output : Using **J7 Con**

- Analog RGB(D-sub 15pin Con) Input : Using **CN202**

- Touch Panel Bypass Connecting : Using **J13,J14 Con**

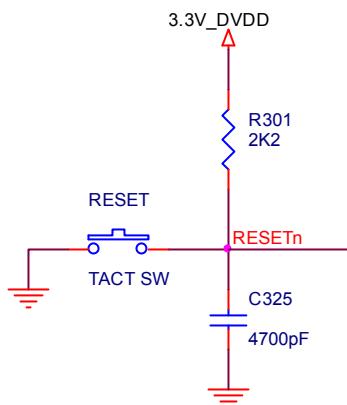
- LCD On/OFF Control by detecting Door Sensor : Using **J8 Con**

**MoniMax 5600****4. User Handling Unit**

2) Reset Circuit : R, C Circuit.

**Table 12: Power-On Reset Specification**

Description	Symbol	Min.	Typical	Max
Power-on reset threshold voltage	Vt	2.10V	2.20V	2.40V
Reset pulse duration	Tr	80ms		100ms
Push-button hold time	Tp	1ms		



3) Power UNIT

(1) Input 1 : +12V, GND

- General LCD (In case of using Inverter for +12V)
- Input 2 : +24V, GND
- High Brightness LCD (In case of using Inverter for +24V)
- Input 3 : +12V, +24V, GND
- In case of driving AD B/D by +12V and driving Inverter by +24V

**\* Be sure to do cable installation including optional external Interface Connector specification**

(2) Output

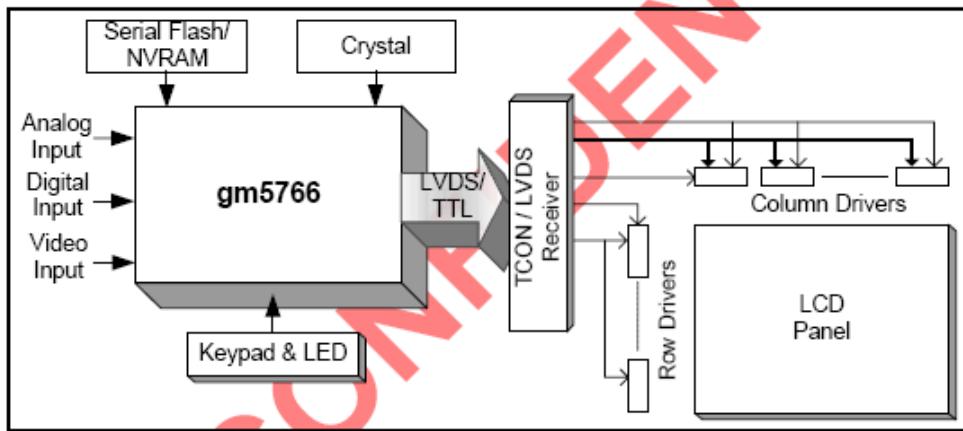
- +12V Bypass : For +12V Inverter
- +24V Bypass : For +24V Inverter
- AP1501 : +5V(Max 3A)
- RC1117-3.3V : +3.3V(Typ 1.5A), for LCD Panel
- AP1120S (Dual Regulator) : For +3.3V (Typ 800mA), +1.8V (Typ 800mA) Core

## MoniMax 5600

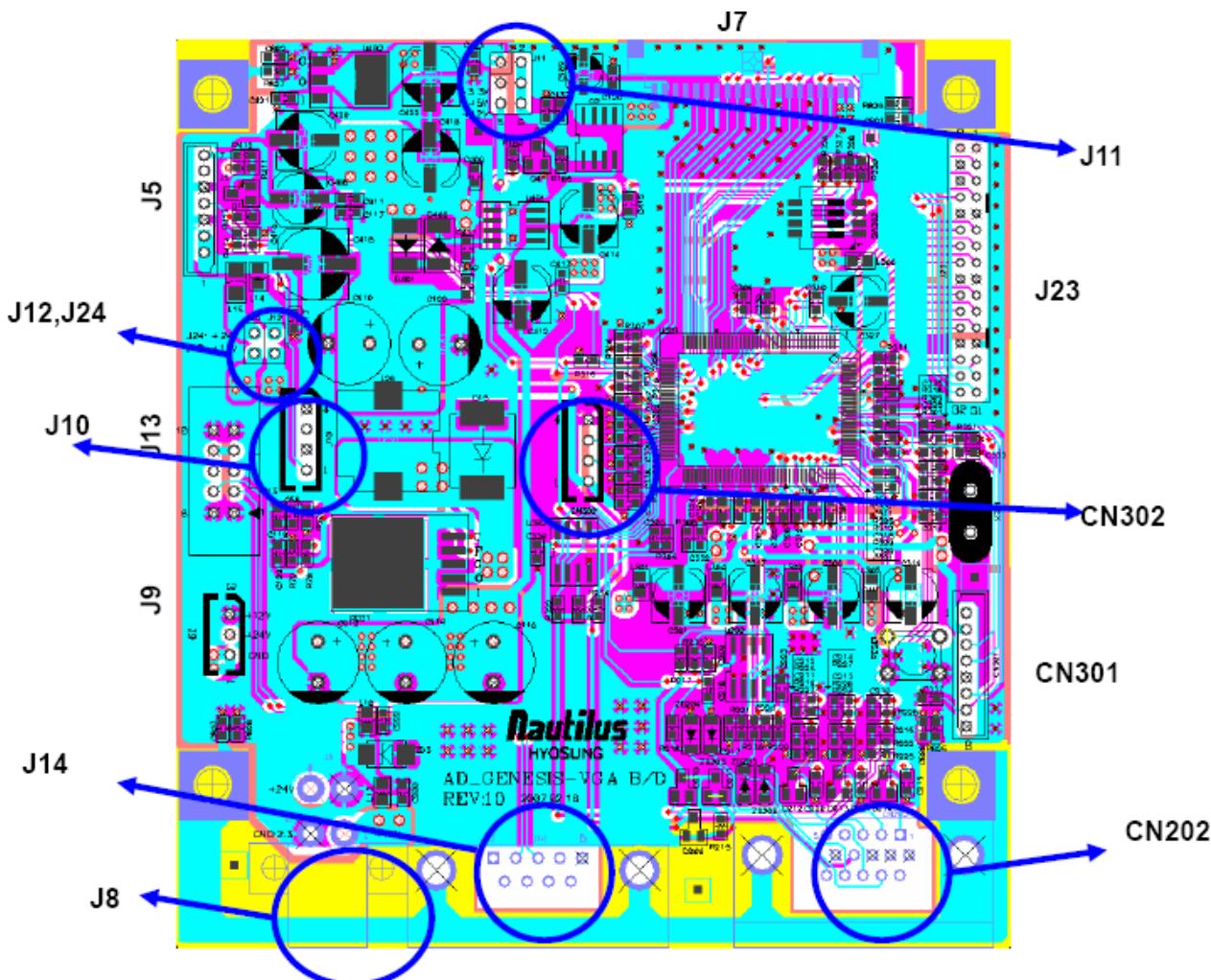
## 4. User Handling Unit

[2] H/W Configuration

**Figure 2: gm5766 System Design Example – LVDS Transmitter**



**External Interface Connector Layout**



**MoniMax 5600****4. User Handling Unit**

[1] External Interface Connector Specification of AD B/D

1) CN301(53014\_8Pin, P/N : 33309308) : OSD B/D

PIN	Description	PIN	Description
1	NC	5	GND
2	VCC(+5V)	6	KEY1
3	LED_GREEN	7	NC
4	LED_RED	8	NC

2) CN302(5267\_4Pin, P/N : 33316303) : For F/W DOWNLOAD

PIN	Description	PIN	Description
1	VCC	3	TXD
2	RXD	4	GND

3) J5(53014\_7Pin, P/N : 33309307) : INVERTER

PIN	Description	PIN	Description
1	VCC (+12V or +24V)	5	GND
2	VCC (+12V or +24V)	6	NC
3	GND	7	BRIGHT_ADJ
4	CONTROL(ON/OFF)	-	-

4) J7(LVDS\_20Pin, P/N : 3345000001) : LVDS Output

PIN	Description	PIN	Description
1	NC(SKIP)	11	GND
2	GND	12	TXOP1
3	TXOP3	13	TXOM1
4	TXOM3	14	GND
5	GND	15	TXOP0
6	TXCLKP1	16	TXOM0
7	TXCLKM2	17	GND
8	GND	18	GND
9	TXOP2	19	PANEL_PWR
10	TXOM2	20	PANEL_PWR

5) J8(5569\_4Pin, P/N : 33311904) : +12V Power Input

PIN	Description	PIN	Description
1	+12V	3	GND
2	GND	4	+24V(Option)

6) J11(JUMPER\_6Pin, P/N : 33313601) : LCD Panel Power Selecting

PIN	JUMPER SETTING
1,2	+ 3.3V (DEFAULT SETTING)
3,4	+ 5V
5,6	+ 12V

**MoniMax 5600****4. User Handling Unit**

7) J13(HIROSE\_10Pin, P/N : 33301410) : Touch Screen(Touch Panel to AD B/D)

PIN	Description	PIN	Description
1	GND	6	GND
2	RXD	7	TXD
3	NC	8	NC
4	+5V	9	+5V
5	GND	10	GND

8) J14(D-SUB 9Pin, P/N : 33401801) : Touch Screen(AD B/D to Host)

PIN	Description	PIN	Description
2	RXD	3	TXD
5	GND		

9) J9(5268\_Molex\_3P, P/N : 33300903) : +12V Power Input (For W-TTW)

PIN	Description	PIN	Description
1	+12V	2	+24V
3	GND	-	-

10) J12/J24 (JUMPER\_4Pin, P/N : 33313601) : LCD Panel Power Selecting

PIN	JUMPER SETTING
J12	+ 12V (DEFAULT SETTING)
J24	+ 24V(24V用 Inverter)

11) J10(5267\_4Pin, P/N : 33316303) : Door Sensor Input

PIN	Description	PIN	Description
1	BKLT_EN	3	NC
2	GND	4	GND

12) CN202(D\_SUB 15Pin, P/N : 33403301) : Analog R,G,B Input

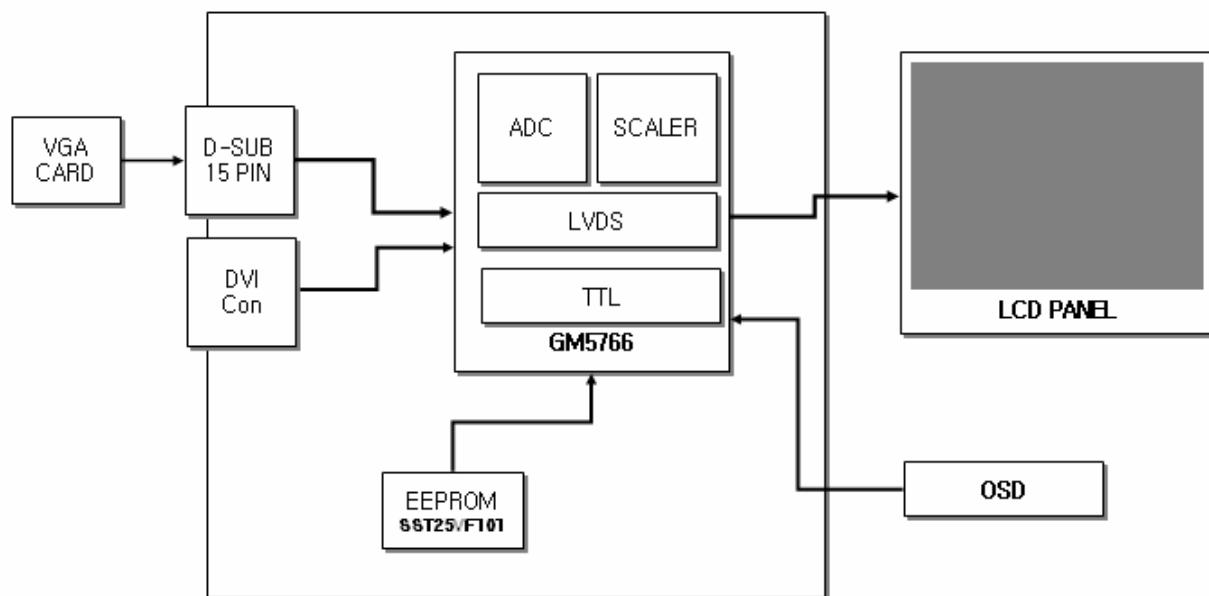
PIN	Description	PIN	Description
1	RED	9	NC
2	GREEN	10	GND
3	BLUE	11	GND
4	GND	12	ASDA
5	VGA_DET	13	H SYNC_A
6	GND	14	V SYNC_A
7	GND	15	ASCL
8	GND	-	-

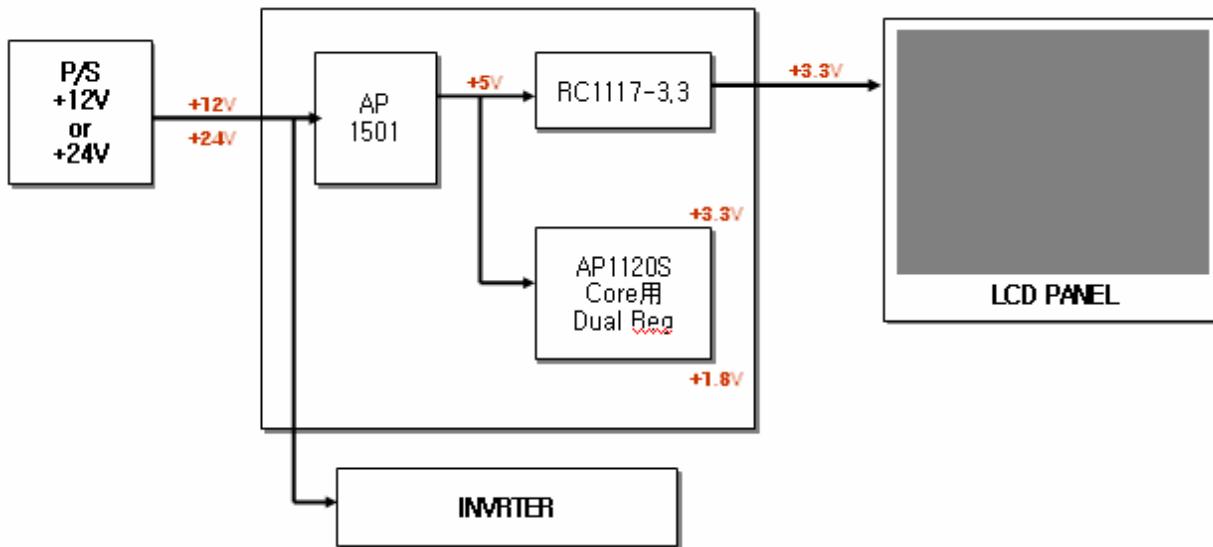
13) J23(YDW200-32P, P/N : 33307532) : TTL Input

PIN	Description	PIN	Description
1	PANEL_PWR	17	GND
2	PANEL_PWR	18	GND
3	DEN	19	GRN1
4	PANEL_PWR	20	GRN0

**MoniMax 5600****4. User Handling Unit**

5	DCLK	21	GRN3
6	GND	22	GRN2
7	DVS	23	GRN5
8	DHS	24	GRN4
9	GND	25	GND
10	GND	26	GND
11	BLUE1	27	RED1
12	BLUE0	28	RED0
13	BLUE3	29	RED3
14	BLUE2	30	RED2
15	BLUE5	31	RED5
16	BLUE4	32	RED4

**AD Genesis B/D Block Diagram****1) Basic Configuration**

**MoniMax 5600****4. User Handling Unit****2) Power Configuration**

## 4.6 Inverter board

### Electrical Characteristics

Analog dimming

No.	Items (Unit)	Sign.	Condition	Min.	Typ.	Max.
1	Input Voltage (Vdc)	Vin		11.5	12	12.5
2	Input Current (A)	Iin	Vin=12V	CTRL=5V	0.3	0.45
				CTRL=0V	0.75	0.92
3	Output Current 1,2(mA)	Iout1,2	Vin=12V	CTRL=5V	1.7	3.0
				CTRL=0V	7.0	8.0
4	Output Current 3,4(mA)	Iout3,4	Vin=12V	CTRL=5V	0	0
				CTRL=0V	0	0
5	Lamp Frequency (kHz)	f	Vin=12V	CTRL=0V	40	50
6	ON/OFF Control	ON	Vin=12V, ON/OFF=5V	Normal Operation		
		OFF	Vin=12V, ON/OFF=0V	Shunt-down (Lamp off)		
7	Dim Adjust (Lamp Current Control)	CTRL	CTRL=0V,Max Current	0 ~ 5 Volt.		
			CTRL=5V,Min Current			
8	Kick-Off Voltage(Vrms)	Vk-off	Kick-Off	More than 1300		
9						

**Functional Pin Description****Input Connector CN1 : 12505WR-10A00**

Pin No.	Symbol	Description
1	CTRL	Dim Adjust, Apply 0V ~ 5Vdc to Control Lamp Current 0V : 8.0mA, 5V : 3.0mA (Each Lamp)
3,4,7,8	GND	GND
5	ON / OFF	Power System Return ( 5V:ON, 0V:OFF )
9,10	Vin	Input Voltage : 12V ± 0.5V

**Output Connector CN2,CN3 : 20015WR-05A00**

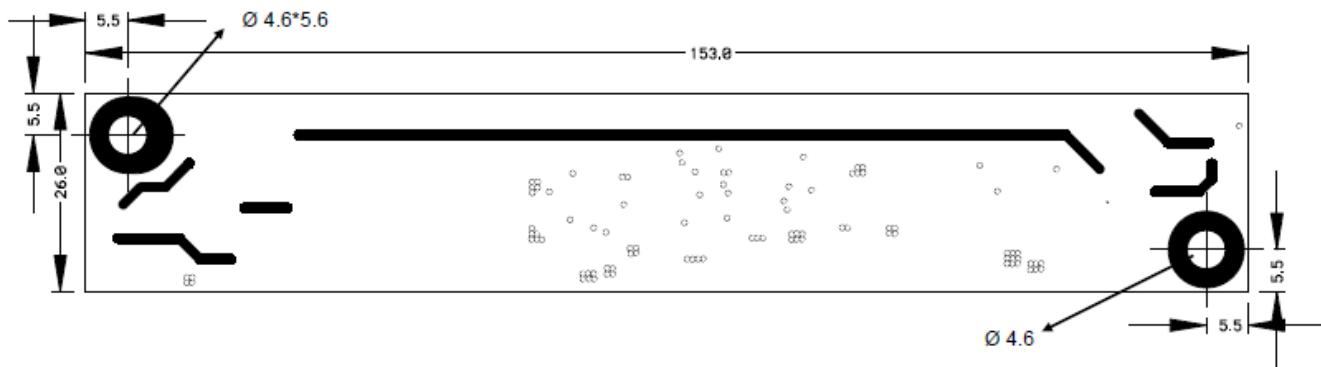
Pin No.	Symbol	Description
1	Lamp H1	High Voltage Connection to high side of Lamp.
2	Lamp L1	Low Voltage Connection to low side of Lamp.

## MoniMax 5600

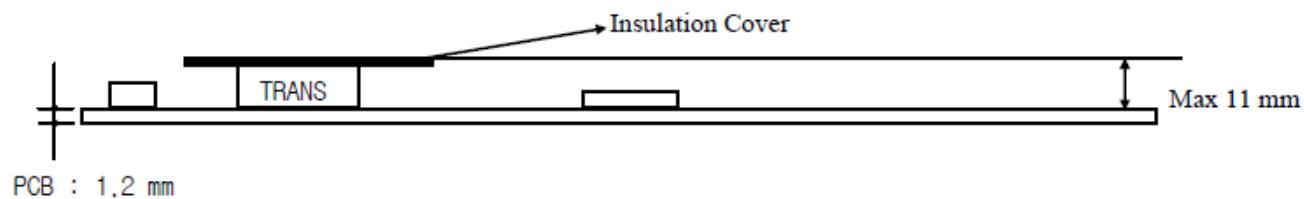
## 4. User Handling Unit

### Mechanical Drawings

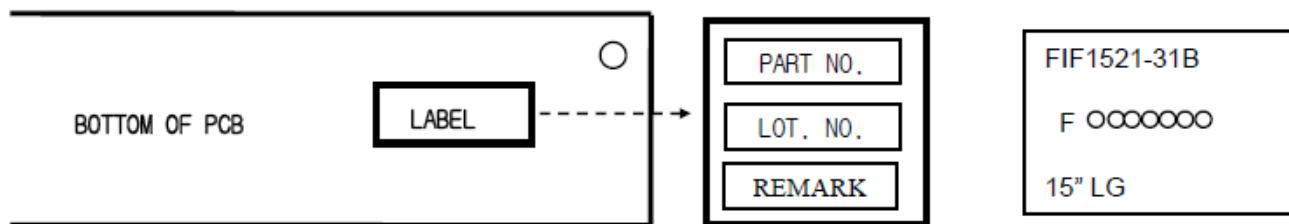
#### P.W.B



#### Component Max Height



#### Marking



## 4.7 Function Key

### 4.7.1 Function Key Code

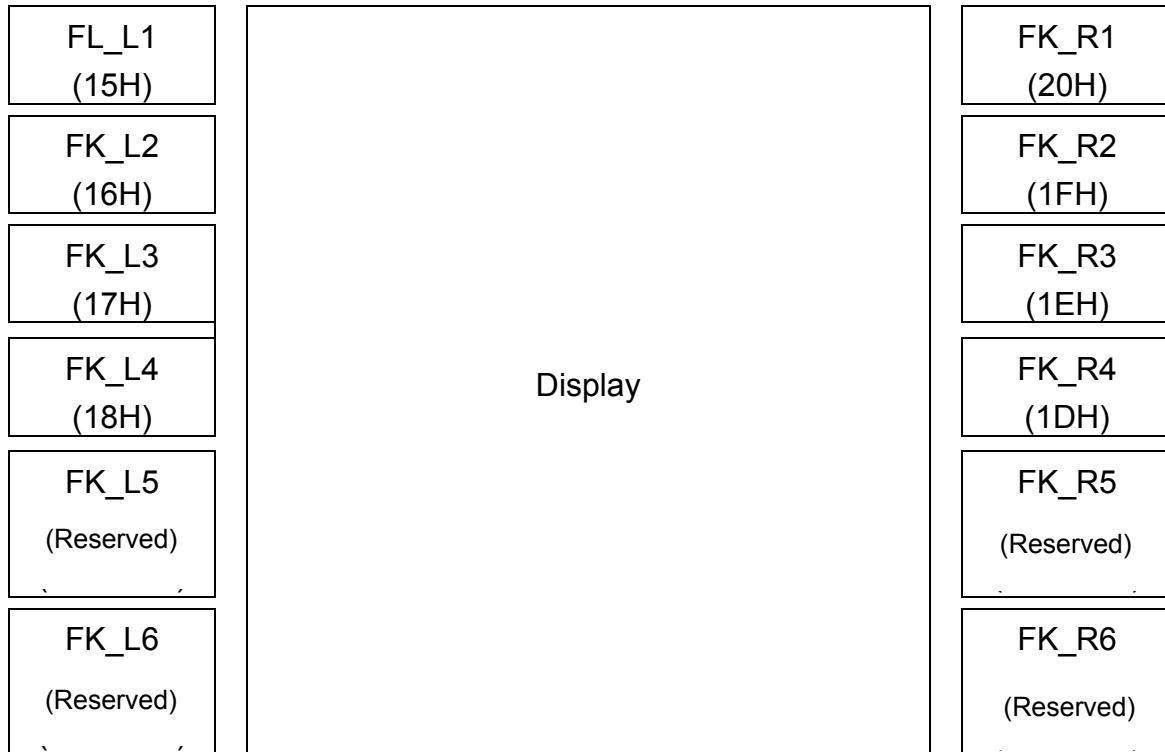
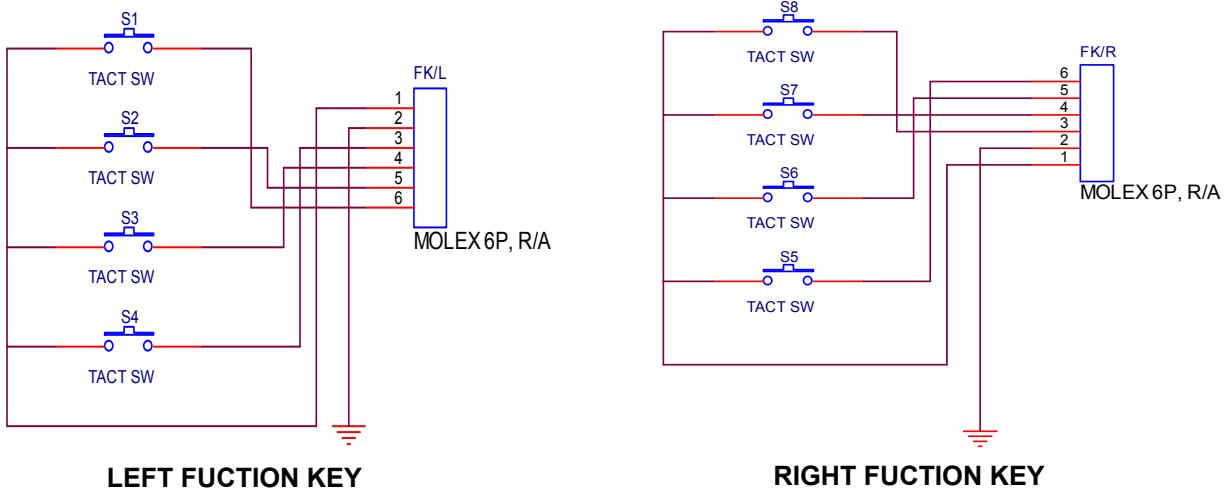


Fig 4.9 The arrangement diagram of Function Key

### 4.7.2 Hardware Configuration

The main role of this board is to input a lot of functions and information which customers want or select.



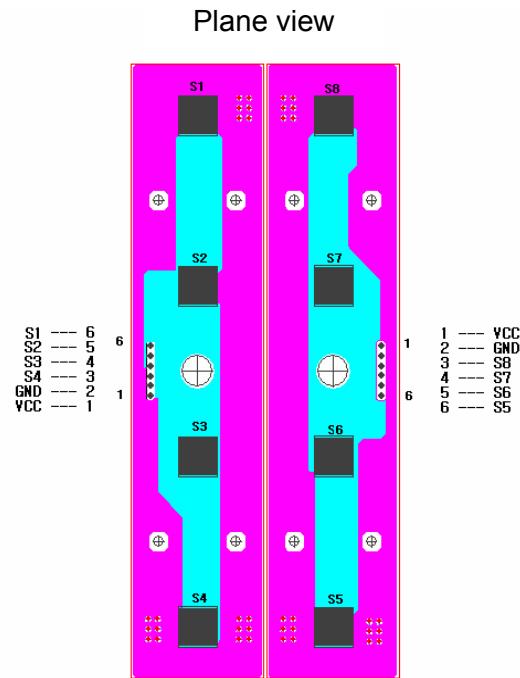
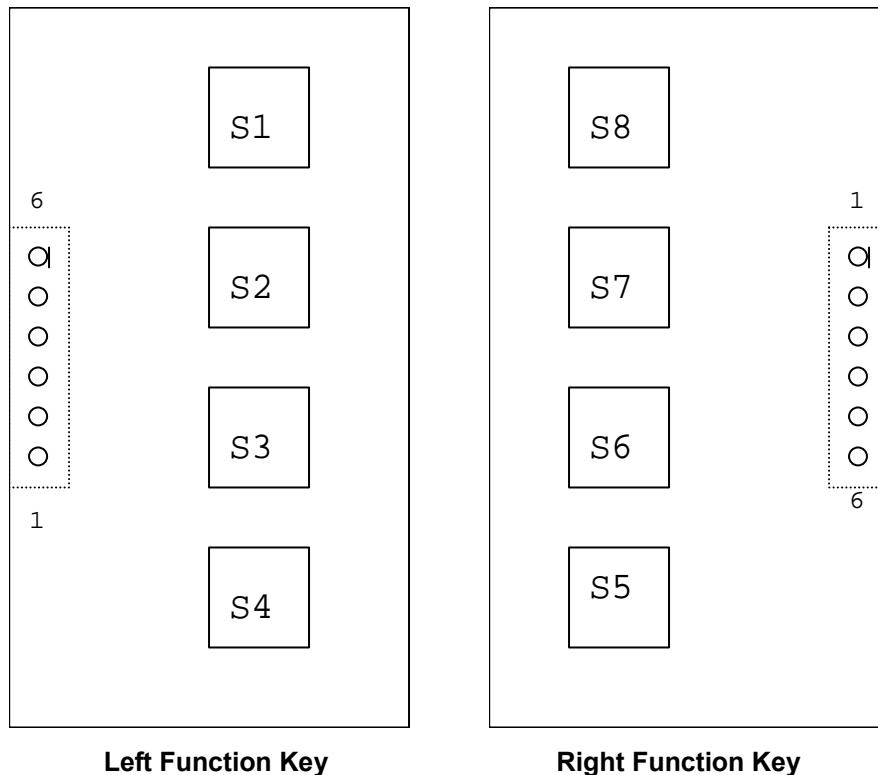
**MoniMax 5600****4. User Handling Unit**

Fig 4.10 The PCB appearance in Function Key

**4.7.3 Connector Configuration and Pin Specification**

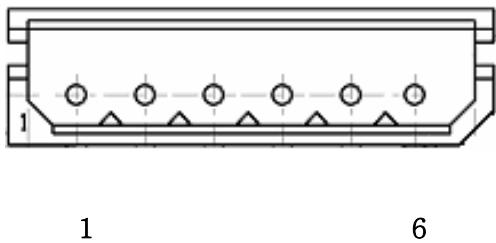
## 1) External interface connector diagram



**MoniMax 5600****4. User Handling Unit**

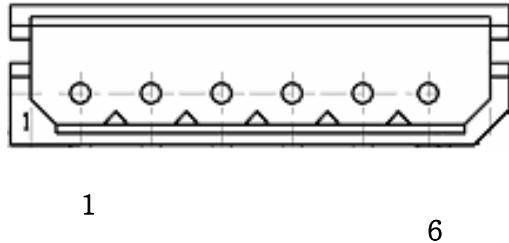
## 2) Pin specification

① FK\_L (Function Key\_Left): 33300906 (CONN:HDR:BOX:R/A:5268-06A:6P)



Pin	Signal
1	VCC
2	GND
3	S4
4	S3
5	S2
6	S1

② FK\_R (Function Key\_Right): 33300906 (CONN:HDR:BOX:R/A:5268-06A:6P)



Pin	Description
1	VCC
2	GND
3	S8
4	S7
5	S6
6	S5

#### 4.7.4 Disassembling the Function Key

- 1) Open the front bezel with key
- 2) Turn power off
- 3) Pull the front bezel outward
- 4) Disassemble the LCD assembly referring to “4.2.1.5 Disassembling the LCD assembly”
- 5) Remove the screws and disconnect the cables connected to the Function keys.
- 6) And then take out the Function keys and replace them with new ones.

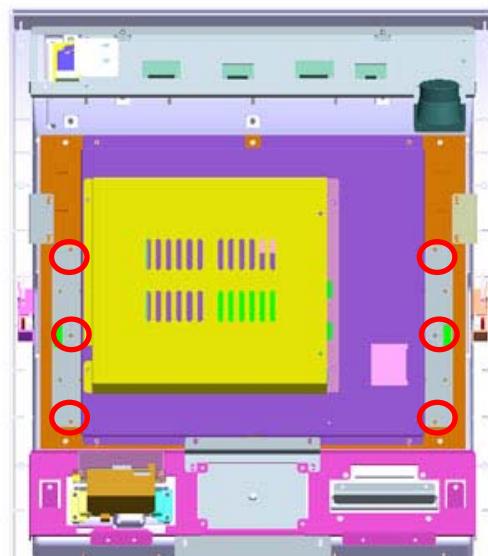


Fig 4.11 The disassembly procedure of Function Key

## 4.8 Bar Code Reader (Option)

The Bar Code Reader used in MoniMax 5600 is a compact single-line, laser scan engine with a patented automatic trigger. It is small, lightweight and had low power requirements.

This Bar Code Reader offers bar code scanning that's easy to configure and integrate. This powerful scan engine incorporates a host of features, providing flexibility for users in a variety of applications.

This Bar Code Reader has built-in decoding, which can be easily updated in the field to keep the scanner current.

Besides the powerful software, the engine is mechanically robust as well. The unit is entirely enclosed to prevent contamination from the environment. The modular design can also be incorporated into a number of different mounting configurations.

### 4.8.1 Features

1. Automatic Scanning Operation : Simply present a bar code and the unit scans in a single pass.
2. Long Range/Short Range Activation : Program activation to meet requirement for various applications.
3. Metal Housing : Prevents damage by eliminating exposed electronic components.
4. Autodiscriminates : Has the ability to scan all standard.



**MoniMax 5600****4. User Handling Unit****4.8.2 Technical Specifications**

<b>Operational</b>	
Light Source	Visible Laser Diode 650 nm ± 10 nm
Host System Interfaces	USB, RS232, Keyboard Wedge, Light Pen Emulation
<b>Mechanical</b>	
Dimensions (LxWxH)	46.9 mm x 41 mm x 19.1 mm (1.85" x 1.61" x 0.75")
Weight	55 g (1.94 oz)
Termination	IS4125: 12 pin ZIF connector; IS4110: 10 pin ZIF connector
<b>Electrical</b>	
Input Voltage	5 VDC ± 0.25 V
Operating Current	125 mA @ 5 VDC - typical
Idle Current	65 mA @ 5 VDC - typical
Sleep Current	9 mA @ 5 VDC - typical
Laser Class	Class 2: IEC60825-1, EN60825-1
EMC	FCC Part 15, ICES-003, EN55022 Class A
<b>Environmental</b>	
Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Storage Temperature	-40°C to 70°C (-40°F to 158°F)
Humidity	5% to 95% relative humidity, non-condensing
Vibration	7 G over 10-500 Hz
Light Levels	4842 Lux (450 foot-candles)
<b>Scan Performance</b>	
Scan Pattern	Single scan line
Scan Speed	52 scan lines per second
Sweep Angle	56°
Print Contrast	35% minimum reflectance difference
Tilt, Pitch, Skew	42°, 68°, 52°
Decode Capability	Code 39, Code 93, Code 128, UPC/EAN/JAN, Code 2 of 5, Code 11, Codabar, MSI Plessey, GS1 DataBar, Telepen, Trioptic

#### 4.8.3 Disassembling the Bar Code Reader

- 1) Insert the key on the front door and turn it clockwise.
- 2) Open the front door by pulling it out and turn power off.
- 3) Unscrew 2 screws on both sides of the front door and then pull the front outward to disassemble the Bar Code Reader easily.



- 4) Remove the screws and connectors to disassemble the Bar Code Reader.



Fig 4.12 The disassembly procedure of EPP module

- 5) Please use the reverse order to assemble the Bar Code Reader again.

## **Chapter 5. Control Electronics**

## 5.1 Appearance of Control Electronics

Control Electronics mainly consist of motherboard, HDD, ODD, multiple serial card, amplification card and etc.

Basic functions and usage of control electronics used this ATM is almost similar to that of personal computer you have dealt with in your office or your home except a multiple serial card used to communicate with some devices like cash dispenser, card reader, receipt printer, EPP.

The following picture will show you the manor component and location used in Control Electronics



Fig. 5.1 (a) External Appearance : IOBP-945G



Fig. 5.1 (b) External Appearance : ECS EG31M

## 5.2 Disassembly/ Assembly of Control Electronics

- 1) Insert the key and turn it clockwise.
- 2) Pull the front panel outward.
- 3) Turn off the power



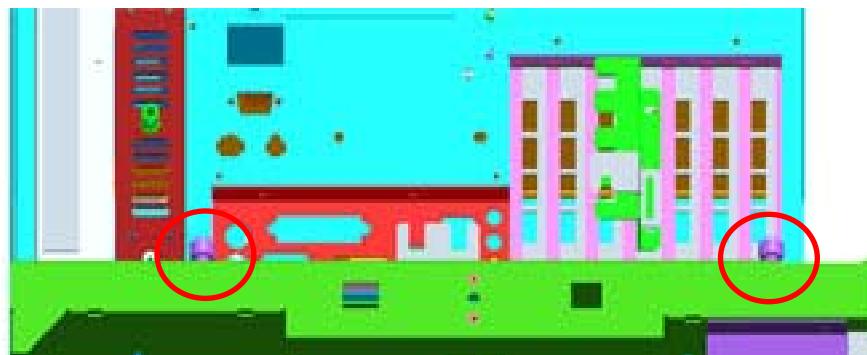
- 4) Unscrew two fixing screws located on the front panel's each side and pull the front panel in the arrow direction



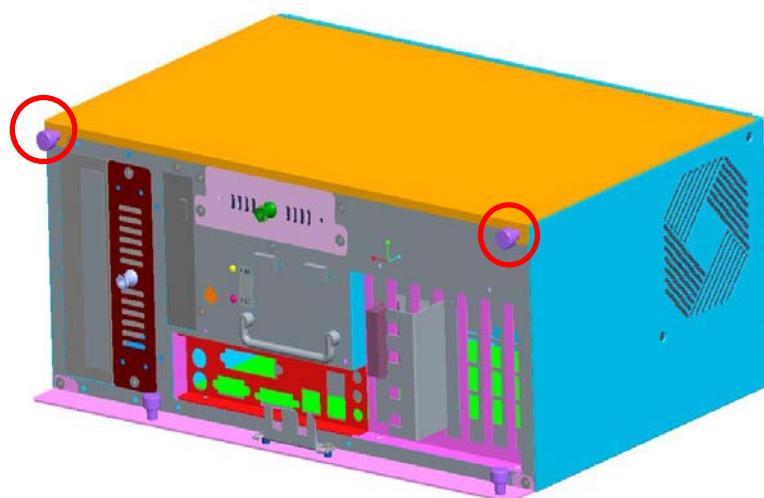
**MoniMax 5600**

**5. Control Electronics**

- 5) Unscrew two thumb screws on both sides of the Control Electronics and take out the Control Electronics.



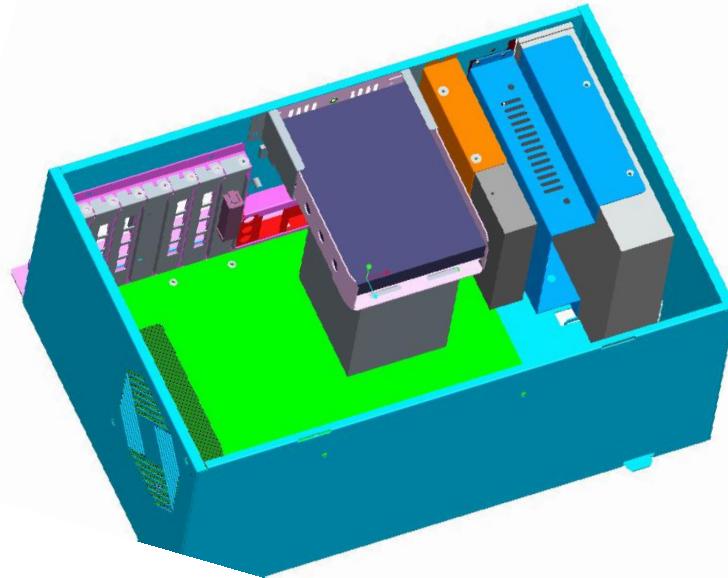
- 6) Remove two thumb screws located on both side of case.



**MoniMax 5600**

**5. Control Electronics**

- 7) The following figure represents the inside of Control Electronics after the cover is removed.

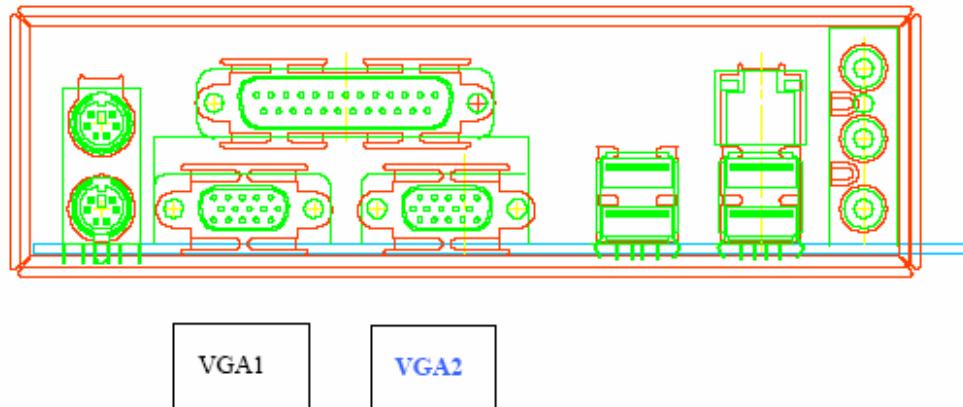


- 8) To take apart electronic board or card you want to replace, just disconnect cables or unscrew a couple of fixing screws  
9) The assembly order is the opposite of the disassembling order.

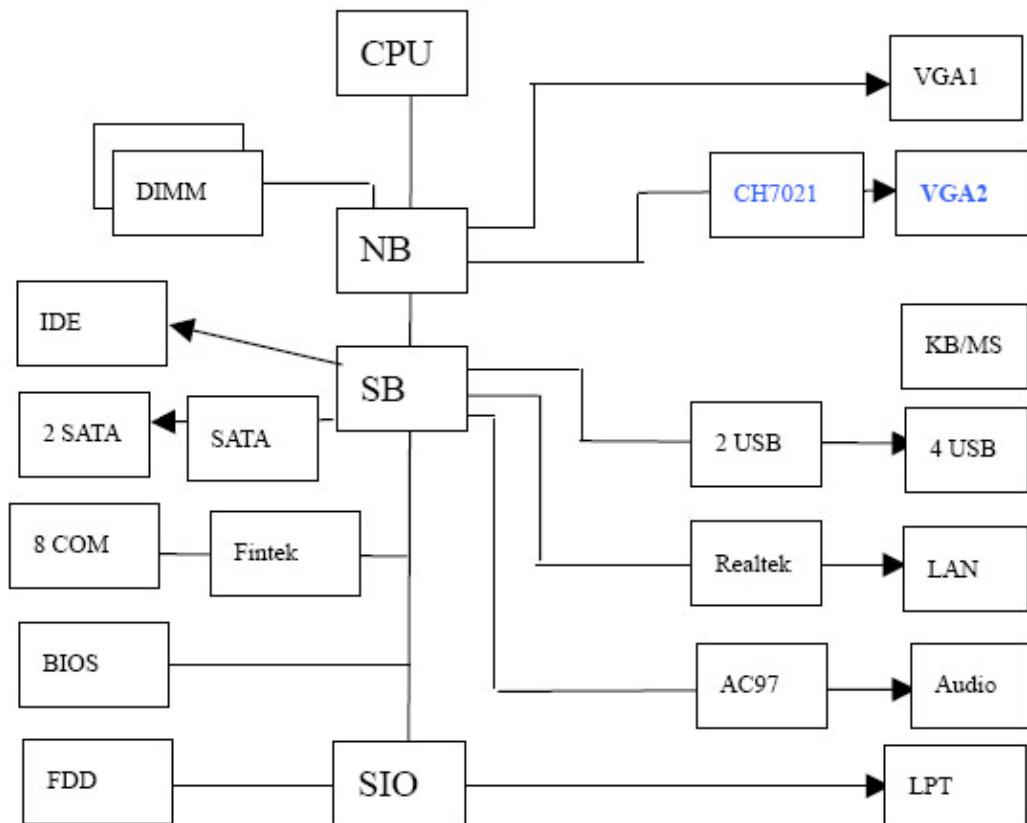
## 5.3 IOBP-945G

### 5.3.1 Main Board

#### Placement for Rear Side



#### Block Diagram



### 5.3.1.1 Specifications

<b>CPU Type:</b>	LGA775 support Intel Pentium 4 / Celeron
<b>FSB:</b>	Support FSB 533/800/1066
<b>System Memory:</b>	2 x DDR2 DIMM support Dual-channel up to 2G
<b>System Chipset:</b>	Intel 945G + ICH7
<b>VGA:</b>	Intel GMCH Integrated Graphics controller Dual independent displays
<b>Primary Display:</b>	VGA with D-SUB 15pin
<b>Secondary Display:</b>	GMCH SDVO & Chrontel CH7021 & VGA VGA output with D-SUB 15pin without DVI
<b>IO Chip:</b>	WINBOND 83627
<b>Audio:</b>	AC97 with Lin-in, Lin-Out, Speak Out (50mW), by phone jack
<b>Network:</b>	BROADCOM PCI Express chipset with RJ-45 connector support 100/1000M Ethernet
<b>Hardware Monitor:</b>	Follow IEI standard
<b>IDE:</b>	1 x ATA 100 with Box-header
<b>SATA:</b>	2 x SATA with SATA connector
<b>Floppy:</b>	1 channel with 2x17 box-header support 1 device
<b>USB:</b>	6 port: 4 with USB stack type A, 2 with 2x5 pin header
<b>IrDA:</b>	None
<b>Series Port:</b>	8 port RS-232 with Fintek chipset, by pin header COM1-COM2 pin9 jump select 5V/12V/Ring All function on ACPI model only
<b>Parallel Port:</b>	1 port with D-SUB 25pin support SPP/EPP/ECP
<b>Keyboard &amp; Mouse:</b>	2 Mini DIN connector for PS/2 Keyboard and Mouse
<b>Digital I/O:</b>	None
<b>Watchdog Timer:</b>	Software programmable supports 1-255 level system reset (Minute / Second selection by Bios)
<b>Power Connector:</b>	20 pin ATX12 connector
<b>Expansion Slot:</b>	3 x PCI Slot
<b>BIOS:</b>	AMI or AWORD Flash BIOS
<b>Form Factor:</b>	304 x 180 mm
<b>Environment:</b>	Operating Temp - 0 to 50 oC
	Storage Temp - -20 to 75 oC
<b>Operating System:</b>	Support Microsoft Windows XP

### 5.3.1.2 Introduction

A licensed copy of AMI BIOS is preprogrammed into the ROM BIOS. The BIOS setup program allows users to modify the basic system configuration. This chapter describes how to access the BIOS setup program and the configuration options that may be changed.

### Starting Setup

The AMI BIOS is activated when the computer is turned on. The setup program can be activated in one of two ways.

- 1) Press the **DELETE** key as soon as the system is turned on or
- 2) Press the **DELETE** key when the “**Press Del to enter SETUP**” message appears on the screen.

If the message disappears before, restart the computer and try again.

### Using Setup

Use the arrow keys to highlight items, press **ENTER** to select, use the “+” and “-“ keys to change entries, press **F1** for help and press **Esc** to quit. Navigation keys are shown in.

BIOS Navigation Keys	Function
<b>Up arrow</b>	Move to previous item
<b>Down arrow</b>	Move to next item
<b>Left arrow</b>	Move to the item on the left hand side
<b>Right arrow</b>	Move to the item on the right hand side
<b>Esc key</b>	Main Menu – Quit and not save changes into CMOS Status Page Setup Menu and Option Page Setup Menu -- Exit current page and return to Main Menu
<b>“+” key</b>	Increase the numeric value or make changes
<b>“-“ key</b>	Decrease the numeric value or make changes
<b>F1 key</b>	General help, only for Status Page Setup Menu and Option Page Setup Menu
<b>F2 /F3 key</b>	Change color from total 16 colors. F2 to select color forward.
<b>F10 key</b>	Save all the CMOS changes, only for Main Menu

### Getting Help

When **F1** is pressed a small help window describing the appropriate keys to use and the possible selections for the highlighted item appears. To exit the Help Window press **Esc** or the **F1** key again.

### Unable to Reboot after Configuration Changes

If the computer cannot boot after changes to the system configuration is made, CMOS defaults. Use the jumper.

### 5.3.1.3 BIOS Menu Bar

The **menu bar** on top of the BIOS screen has the following main items:

Main Changes the basic system configuration.

Advanced Changes the advanced system settings.

Boot Changes the system boot configuration.

Security Sets User and Supervisor Passwords.

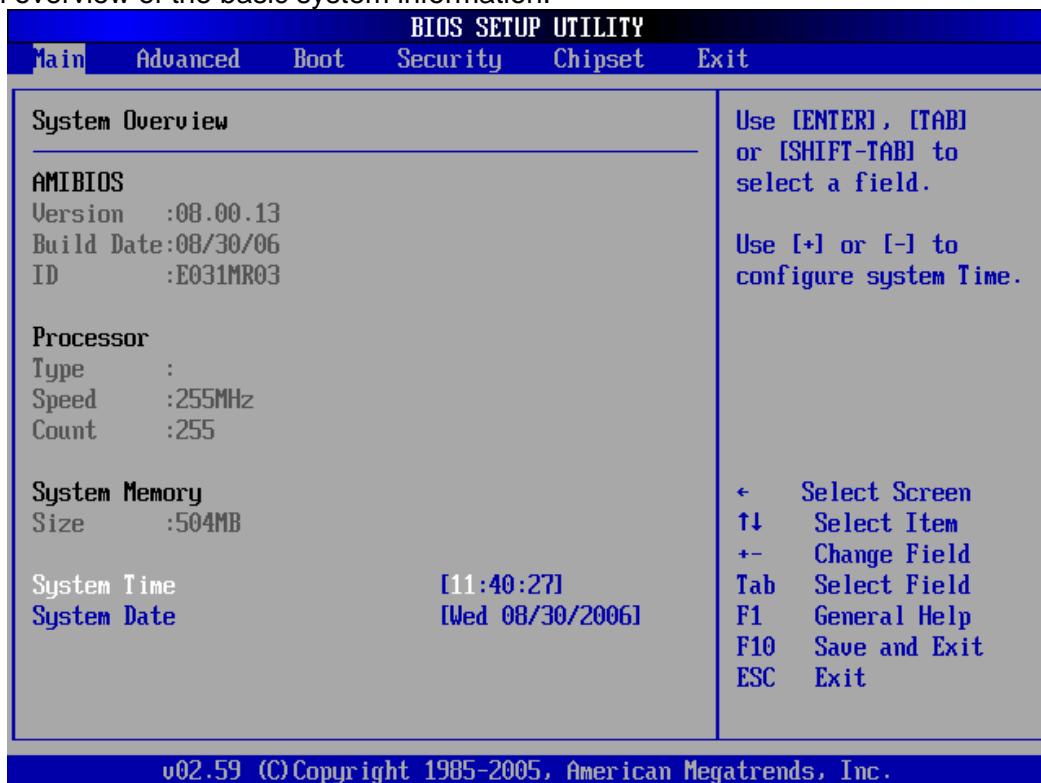
Chipset Changes the chipset settings.

Exit Selects exit options and loads default settings

The following sections completely describe the configuration options found in the menu items at the top of the BIOS screen and listed above.

#### Main

When the **BIOS Setup** program is entered, the **Main** menu (**BIOS Menu 1**) appears. The **Main** menu gives an overview of the basic system information.



**BIOS Menu 1: Main**

**System Overview**

The System Overview lists a brief summary of different system components. The fields in System Overview cannot be changed. The items shown in the system overview include:

AMI BIOS:	Displays auto-detected BIOS information
Version:	Current BIOS version
Build Date:	Date the current BIOS version was made
ID:	Installed BIOS ID
Processor:	<b>Displays auto-detected CPU specifications</b>
Type:	Names the currently installed processor
Speed:	Lists the processor speed
Count:	The number of CPUs on the motherboard
<b>System Memory:</b>	<b>Displays the auto-detected system memory.</b>
Size:	Lists memory size

The **System Overview** field also has two user configurable fields:

**System Time [xx:xx:xx]:** The system time is set here.

**System Date [Day xx/xx/yyyy]:** The system date is set here.

**Advanced**

The **Advanced** menu (**BIOS Menu 2**) allows access to the CPU and peripheral device configuration options through the following sub-menus:

**WARNING:**

Setting the wrong values in the sections below may cause the system to malfunction.

Make sure that the settings made are compatible with the hardware.

**BIOS SETUP UTILITY**

Main	Advanced	Boot	Security	Chipset	Exit
------	----------	------	----------	---------	------

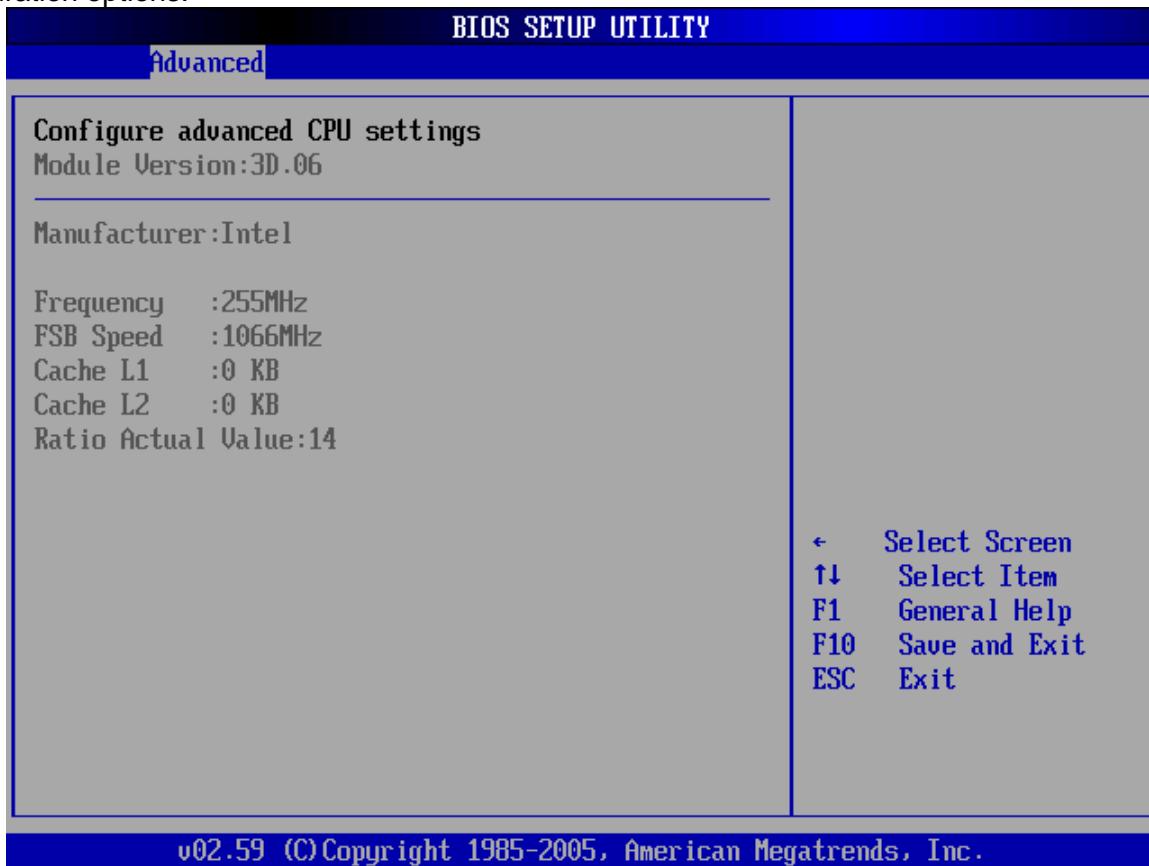
<p><b>Advanced Settings</b></p> <hr/> <p>WARNING: Setting wrong values in below sections may cause system to malfunction.</p> <ul style="list-style-type: none"> <li>▶ CPU Configuration</li> <li>▶ IDE Configuration</li> <li>▶ Floppy Configuration</li> <li>▶ SuperIO Configuration</li> <li>▶ Hardware Health Configuration</li> <li>▶ ACPI Configuration</li> <li>▶ APM Configuration</li> <li>▶ MPS Configuration</li> <li>▶ USB Configuration</li> </ul>	<p>Configure CPU.</p> <p style="text-align: right;">← Select Screen ↑↓ Select Item Enter Go to Sub Screen F1 General Help F10 Save and Exit ESC Exit</p>
---	--

v02.59 (C) Copyright 1985-2005, American Megatrends, Inc.

**BIOS Menu 2: Advanced**

**CPU Configuration**

The CPU Configuration menu (BIOS Menu 3) shows detailed CPU specifications and CPU configuration options.



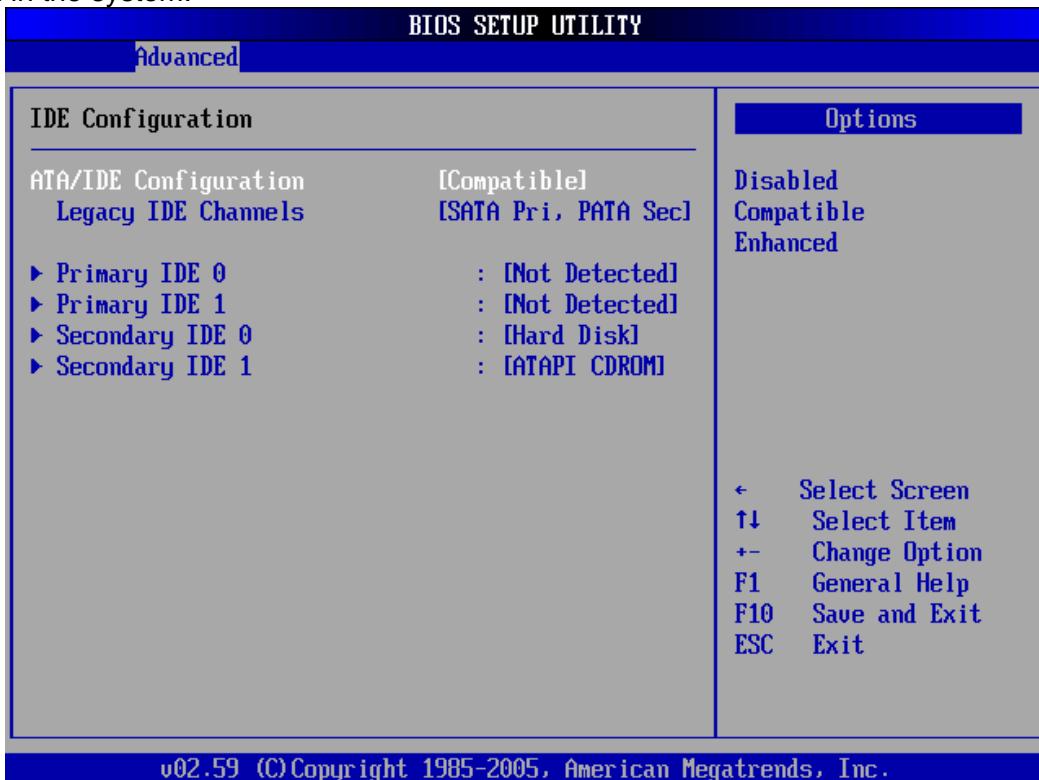
**BIOS Menu 3: CPU Configuration**

The CPU Configuration menu (**BIOS Menu 3**) lists the following CPU details:

Manufacturer:	Lists the name of the CPU manufacturer
Brand String:	Lists the brand name of the CPU being used
Frequency:	Lists the CPU processing speed
FSB Speed:	Lists the FSB speed
Cache L1:	Lists the CPU L1 cache size
Cache L2:	Lists the CPU L2 cache size

## IDE Configuration

The IDE Configuration menu (BIOS Menu 4) allows changes to the configurations for the IDE devices installed in the system.



**BIOS Menu 4: IDE Configuration**

### ATA/IDE Configuration [Compatible]

The ATA/IDE Configuration BIOS option allows the user to configure the ATA/IDE device mode.

Compatible      Default      Up to 6 HDDs can be used, four for SATA and the other for PATA IDE. If this option is selected, "Legacy IDE Channels" option is presented for configuration.

### Legacy IDE Channels [SATA Pri, PATA Sec]

Use the Legacy IDE Channels option configures PATA and SATA resources for operating systems that require legacy IDE operation.

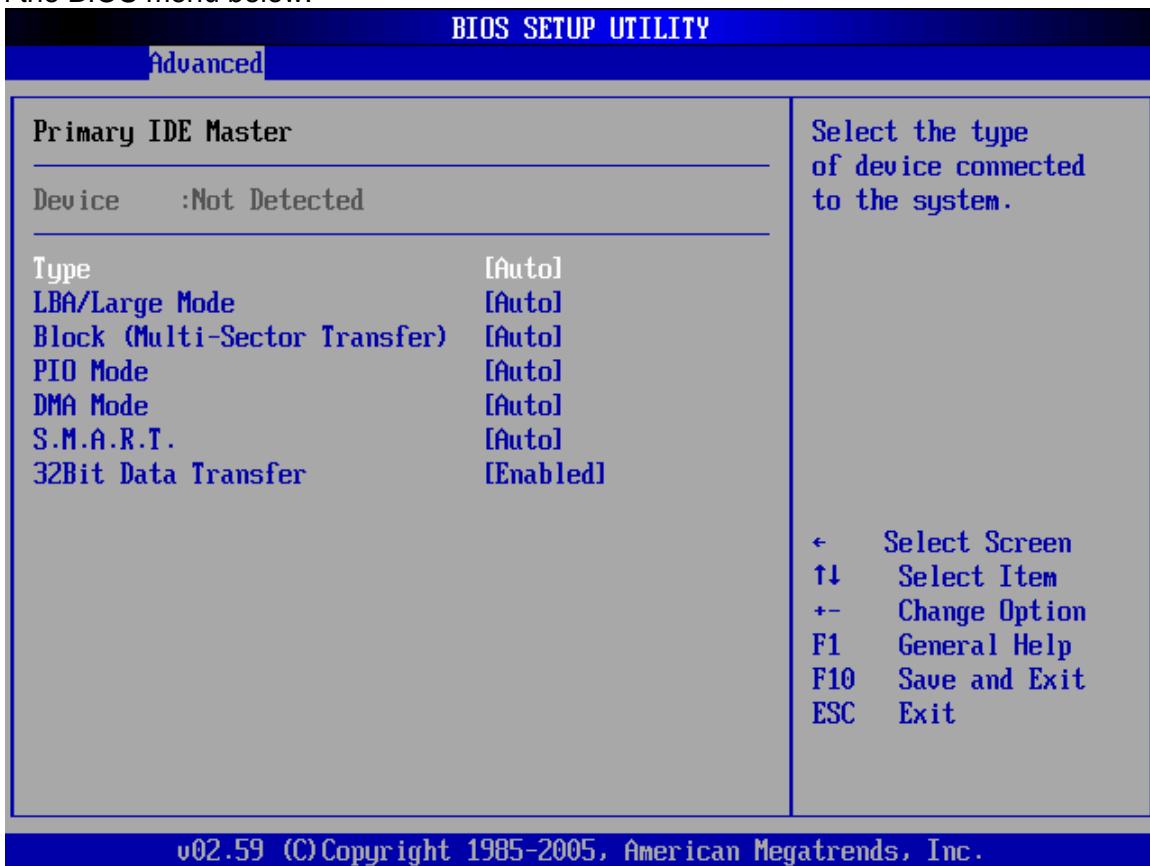
SATA      Pri,      Default      This option allows the system to access the SATA devices before the  
PATA Sec                primary IDE devices

### IDE Master and IDE Slave

When entering setup, BIOS auto detects the presence of IDE devices. This displays the status of the auto detected IDE devices. The following IDE devices are detected and are shown in the **IDE Configuration** menu:

- Primary IDE 0
- Primary IDE 1
- Secondary IDE 0
- Secondary IDE 1

The **IDE Configuration** menu (**BIOS Menu 4**) allows changes to the configurations for the IDE devices installed in the system. If an IDE device is detected, and one of the above listed four BIOS configuration options are selected, the IDE configuration options shown in IDE Master, IDE Slave IDE Master and IDE Slave configuration options for both primary and secondary IDE devices are shown in the BIOS menu below.



**BIOS Menu 5: IDE Master and IDE Slave Configuration**

#### Auto-Detected Drive Parameters

The “grayed-out” items in the left frame are IDE disk drive parameters automatically detected from the firmware of the selected IDE disk drive. The drive parameters are listed as follows:

Device: Lists the device type (e.g. hard disk, CD-ROM etc.)

Vendor: Lists the device manufacturer

Size: The size of the device.

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LBA Mode: Indicates whether the LBA (Logical Block Addressing) is a method of addressing data on a disk drive is supported or not.

Block Mode: Block mode boosts IDE drive performance by increasing the amount of data transferred. Only 512 bytes of data can be transferred per interrupt if block mode is not used. Block mode allows transfers of up to 64 KB per interrupt.

PIO Mode: Indicates the PIO mode of the installed device.

Async DMA: Indicates the highest Asynchronous DMA Mode that is supported.

Ultra DMA: Indicates the highest Synchronous DMA Mode that is supported.

S.M.A.R.T.: Indicates whether or not the Self-Monitoring Analysis and Reporting Technology protocol is supported.

**Type [Auto]**

The **Type** BIOS option determines the type of device that the AMIBIOS attempts to boot from after the Power-On Self-Test (POST) has completed.

Not Installed	Selecting this value prevents the BIOS from searching for an IDE disk drive on the specified channel.
---------------	---

Auto	Default	This selection enables the BIOS to auto detect the IDE disk drive type attached to the specified channel. This setting should be used if an IDE hard disk drive is attached to the specified channel.
------	---------	---

CD/DVD	The CD/DVD option specifies that an IDE CD-ROM drive is attached to the specified IDE channel. The BIOS does not attempt to search for other types of IDE disk drives on the specified channel.
--------	---

ARMD	This option specifies an ATAPI Removable Media Device. These include, but are not limited to:
------	---

**ZIP**

**LS-120**

**LBA/Large Mode [Auto]**

The **LBA/Large Mode** BIOS option disables or auto detects LBA (Logical Block Addressing). LBA is a method of addressing data on a disk drive. In LBA mode, the maximum drive capacity is 137 GB.

- |          |   |
|----------|---|
| Disabled | This selection prevents the BIOS from using the LBA mode control on the specified channel.        |
| Auto     | Default This option allows the BIOS to auto detect the LBA mode control on the specified channel. |

**Block (Multi Sector Transfer) [Auto]**

- |          |  |
|----------|--|
| Disabled | Selecting this option prevents the BIOS from using Multi-Sector Transfer on the specified channel. The data to and from the device occurs one sector at a time.  |
| Auto     | Default Selecting this value to allows the BIOS to auto detect the device support for Multi-Sector Transfers on the specified channel. If supported. Select this value to allow the BIOS to auto detect the number of sectors per block for transfer from the hard disk drive to the memory. The data transfer to and from the device occurs multiple sectors at a time. |

**PIO Mode [Auto]**

The **PIO Mode** option selects the IDE PIO (Programmable I/O) mode program timing cycles between the IDE drive and the programmable IDE controller. As the PIO mode increases, the cycle time decreases.

- |      |  |
|------|--|
| Auto | Default This setting allows the BIOS to auto detect the PIO mode. Use this value if the IDE disk drive support cannot be determined.   |
| 0    | PIO mode 0 selected with a maximum transfer rate of 3.3MBps  |
| 1    | PIO mode 1 selected with a maximum transfer rate of 5.2MBps  |
| 2    | PIO mode 2 selected with a maximum transfer rate of 8.3MBps  |
| 3    | PIO mode 3 selected with a maximum transfer rate of 11.1MBps   |
| 4    | PIO mode 4 selected with a maximum transfer rate of 16.6MBps<br><br>(This setting generally works with all hard disk drives manufactured after 1999. For other disk drives, such as IDE CD-ROM drives, check the specifications of the drive.) |

**DMA Mode [Auto]**

The **DMA Mode** BIOS selection adjusts the DMA mode options.

Auto      Default      The BIOS auto detects the DMA mode. Use this value if the IDE disk drive support cannot be determined.

**S.M.A.R.T [Auto]**

Self-Monitoring Analysis and Reporting Technology (SMART) feature can help predict impending drive failures. The **S.M.A.R.T** BIOS option enables or disables this function.

Auto	Default	BIOS to auto detects if the hard disk drive supports S.M.A.R.T. Use this setting if the IDE disk drive support cannot be determined.
Disabled		Select this value to prevent the BIOS from using the SMART feature.
Enabled		Select this value to allow the BIOS to use the SMART feature on support hard disk drives.

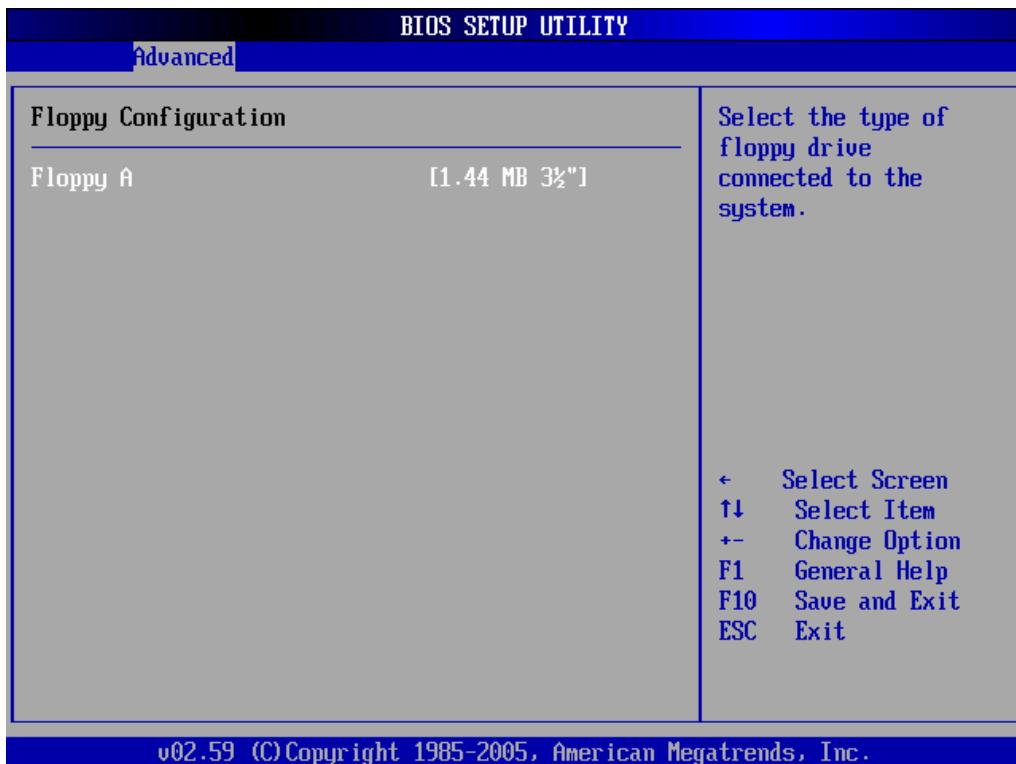
**32Bit Data Transfer [Enabled]**

The **32Bit Data Transfer** BIOS option enables or disables 32-bit data transfers.

Disabled		Prevents the BIOS from using 32-bit data transfers.
Enabled	Default	Allows BIOS to use 32-bit data transfers on support hard disk drives.

## Floppy Configuration

Use the Floppy Configuration menu (BIOS Menu 6) to set or change the configurations for floppy disk drives.



**BIOS Menu 6: Floppy Configuration**

### Floppy A [1.44 MB 3½"]

The **Floppy A** configuration option determines the types of the floppy drive installed in the system. The following configuration options are available.

#### **Disabled (default)**

**360 KB 5¼"**

**1.2 MB 5¼"**

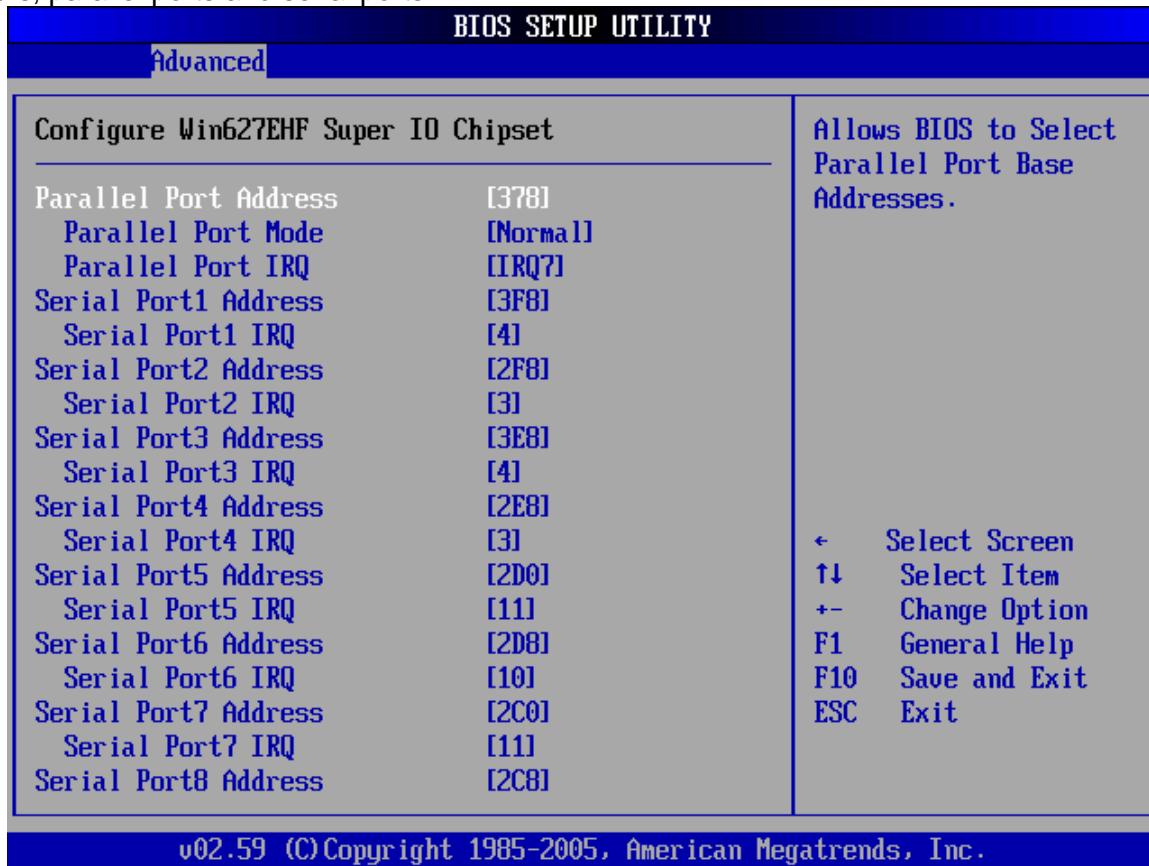
**720 KB 3 ½"**

**1.44 MB 3½"**

**2.88 MB 3½"**

## Super IO Configuration

The **Super IO Configuration** menu (**BIOS Menu 7**) sets or changes the configurations for the FDD controllers, parallel ports and serial ports.



### BIOS Menu 7: Super IO Configuration

#### Serial Port1 Address [3F8]

This option allows BIOS to select the base addresses for serial port 1

- |          |  |                                       |
|----------|--|---------------------------------------|
| Disabled | No base address is assigned to serial port 3 |                                       |
| 3F8      | Default                                      | Serial port 3 I/O port address is 3F8 |

#### Serial Port1 IRQ [4]

The **Serial Port1 IRQ** selection sets the interrupt address for serial port 1.

- |   |                                |                                |
|---|--------------------------------|--------------------------------|
| 3 | Serial port 1 IRQ address is 3 |                                |
| 4 | Default                        | Serial port 1 IRQ address is 4 |

**Serial Port2 Address [3E8]**

This option allows BIOS to select the base addresses for serial port 2

Disabled	No base address is assigned to serial port 3
3E8	Default Serial port 3 I/O port address is 3E8

**Serial Port2 IRQ [4]**

The **Serial Port2 IRQ** selection sets the interrupt address for serial port 2.

3	Default	Serial port 2 IRQ address is 3
4		Serial port 2 IRQ address is 4

**Parallel Port Address [378]**

This option allows BIOS to select the base addresses for the Parallel Port

Disabled	No base address is assigned to the Parallel Port
378	Default Parallel Port I/O port address is 378
278	Parallel Port I/O port address is 278
3BC	Parallel Port I/O port address is 3BC

**Parallel Port Mode [Normal]**

The **Parallel Port Mode** selection selects the mode the parallel port operates in.

Normal	Default	The normal parallel port mode is the standard mode for parallel port operation.
EPP		The parallel port operates in the enhanced parallel port mode (EPP). The EPP mode supports bi-directional communication between the system and the parallel port device and the transmission rates between the two are much faster than the Normal mode.
ECP		The parallel port operates in the extended capabilities port (ECP) mode. The ECP mode supports bi-directional communication between the system and the parallel port device and the transmission rates between the two are much faster than the Normal mode
EPP+ECP		The parallel port becomes compatible with EPP and ECP devices described above

**Parallel Port IRQ [IRQ7]**

The **Parallel Port Address** BIOS option assigns the parallel port interrupt address. The following address options are available.

IRQ5	Parallel port interrupt address is IRQ5
------	---

**MoniMax 5600****5.Control Electronics**

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IRQ7      Default      Parallel port interrupt address is IRQ7

**Serial Port3 Address [3E8]**

This option allows BIOS to select the base addresses for serial port 3

Disabled	No base address is assigned to serial port 3
3E8	Default      Serial port 3 I/O port address is 3E8

**Serial Port3 IRQ [4]**

The Serial Port3 IRQ selection sets the interrupt address for serial port 3.

3	Serial port 3 IRQ address is 10
4	Default      Serial port 3 IRQ address is 11

**Serial Port4 Address [2E8]**

This option allows BIOS to select the base addresses for serial port 4.

Disabled	No base address is assigned to serial port 4
2E8	Default      Serial port 4 I/O port address is 2E8

**Serial Port4 IRQ [10]**

The **Serial Port4 IRQ** selection sets the interrupt address for serial port 4.

3	Default      Serial port 4 IRQ address is 10
4	Serial port 4 IRQ address is 11

**Serial Port5 Address [2D0]**

This option allows BIOS to select the base addresses for serial port 5.

Disabled	No base address is assigned to serial port 5
2D0	Default      Serial port 5 I/O port address is 2D0

**Serial Port5 IRQ [11]**

The **Serial Port5 IRQ** selection sets the interrupt address for serial port 5.

10	Serial port 5 IRQ address is 10
11	Default      Serial port 5 IRQ address is 11

**Serial Port6 Address [2D8]**

This option allows BIOS to select the base addresses for serial port 6.

Disabled	No base address is assigned to serial port 6
----------	--

**MoniMax 5600****5. Control Electronics**

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2D80      Default      Serial port 6 I/O port address is 2D8

**Serial Port6 IRQ [10]**

The **Serial Port6 IRQ** selection sets the interrupt address for serial port 6.

10	Default	Serial port 6 IRQ address is 10
11		Serial port 6 IRQ address is 11

**Serial Port7 IRQ [11]**

The **Serial Port7 IRQ** selection sets the interrupt address for serial port 7.

10		Serial port 7 IRQ address is 10
11	Default	Serial port 7 IRQ address is 11

**Serial Port7 Address [2C8]**

This option allows BIOS to select the base addresses for serial port 7.

Disabled		No base address is assigned to serial port 7
2C0	Default	Serial port 7 I/O port address is 2C0

**Serial Port8 IRQ [10]**

The **Serial Port8 IRQ** selection sets the interrupt address for serial port 8.

10	Default	Serial port 8 IRQ address is 10
11		Serial port 8 IRQ address is 11

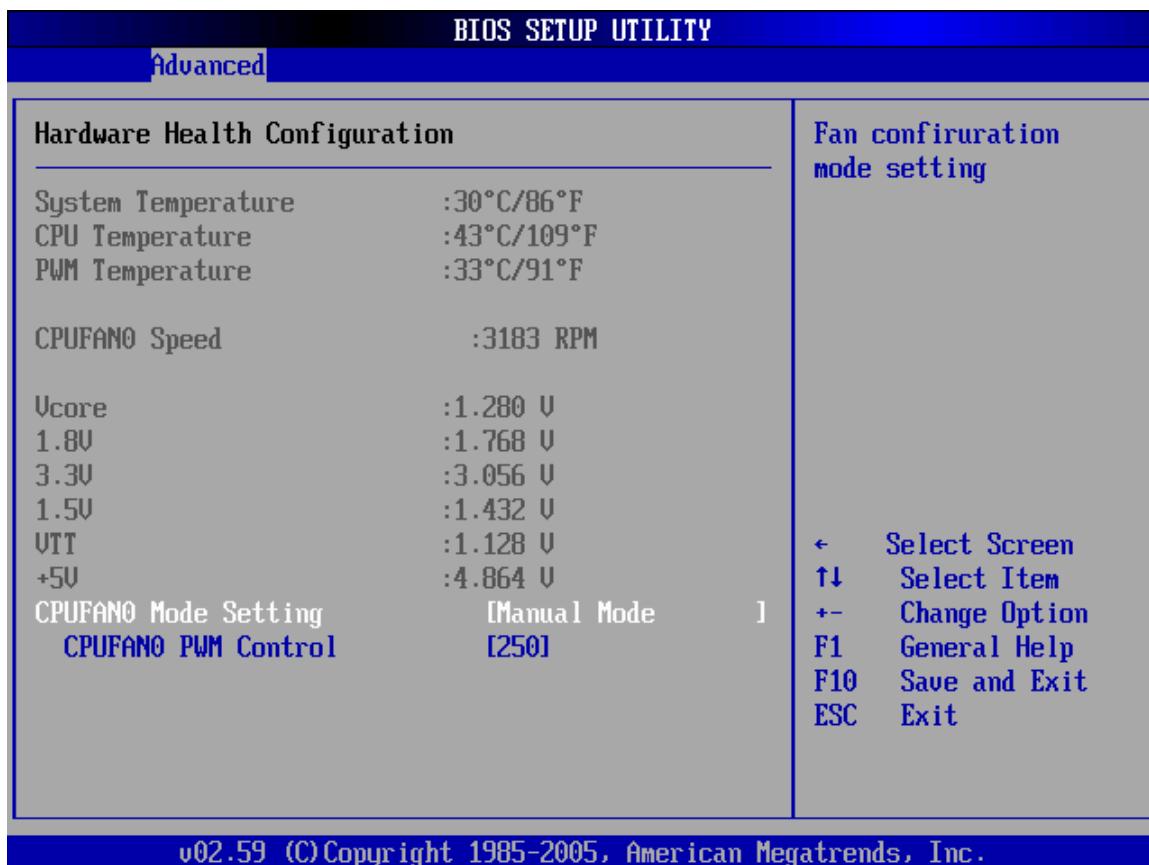
**Serial Port8 Address [2C8]**

This option allows BIOS to select the base addresses for serial port 8.

Disabled		No base address is assigned to serial port 8
2D80	Default	Serial port 8 I/O port address is 2C8

## Hardware Health Configuration

The **Hardware Health Configuration** menu (**BIOS Menu 8**) shows the operating temperature, fan speeds and system voltages.



### BIOS Menu 8: Hardware Health Configuration

The following system parameters and values are shown. The system parameters that are monitored are:

#### **System Temperatures: The following system temperatures are monitored**

CPU Temperature

System Temperature

#### **Fan Speeds: The CPU cooling fan speed is monitored.**

Fan1 Speed

Fan2 Speed

Fan3 Speed

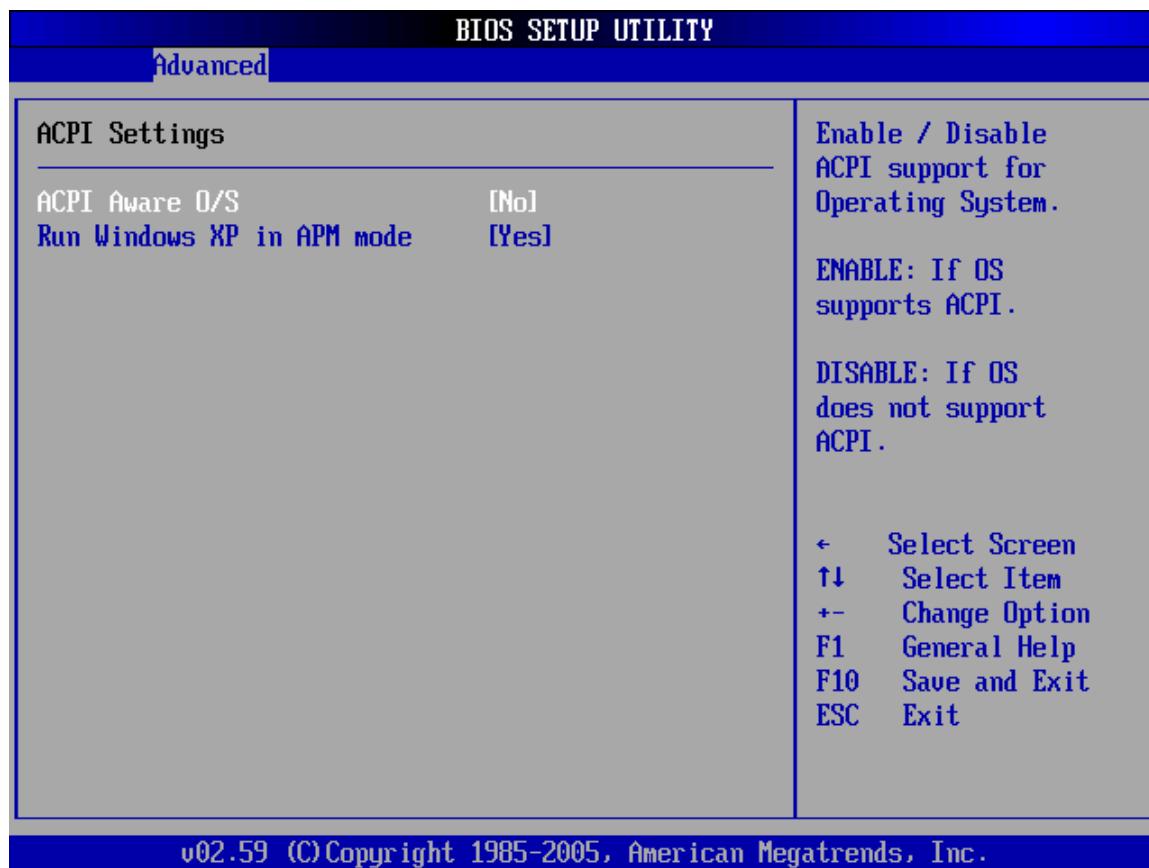
#### **Voltages: The following system voltages are monitored**

CPU Core

DRAM Vcc  
+3.30V  
+5.00V  
+12V  
FSB Vcc +1.20V  
+1.50V  
VBAT

### ACPI Configuration

The **ACPI Configuration** menu (**BIOS Menu 9**) configures the Advanced Configuration and Power Interface (ACPI) and Power Management (APM) options.



BIOS Menu 9: ACPI Configuration

**ACPI Aware O/S [No]**

Use the **ACPI Aware O/S** option to enable the system to configure ACPI power saving options. ACPI can only be implemented if the system OS complies with the ACPI standard. Windows 98, Windows 2000, and Windows XP all comply with ACPI.

- |     |         |   |
|-----|---------|---|
| No  | Default | Disables the ACPI support for the OS. This selection should be disabled if the OS does not support ACPI         |
| Yes |         | Enables the ACPI support for the operating system. This selection should be enabled if the OS does support ACPI |

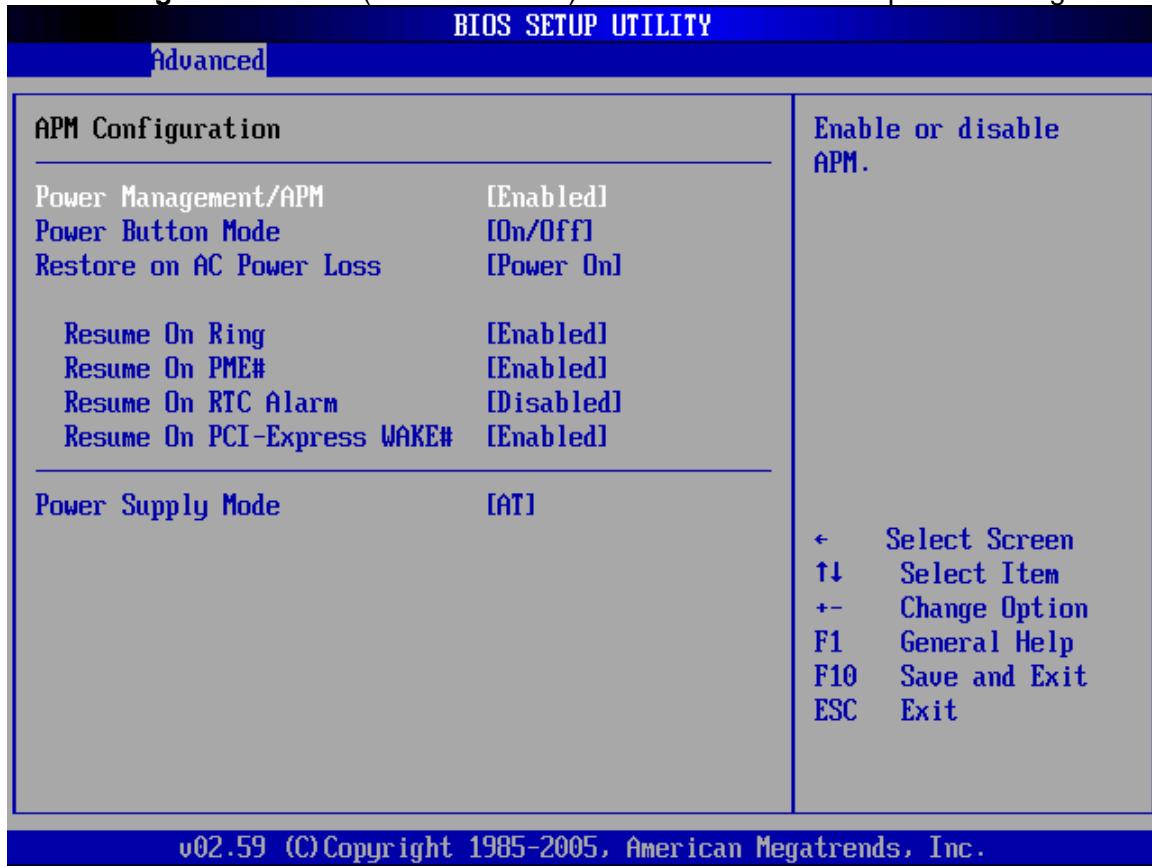
**Run Windows XP in APM mode [Yes]**

For support customer's request support APM mode in Windows XP

- |     |         |   |
|-----|---------|---|
| No  |         | Disables the APM mode support for the operating system. |
| Yes | Default | Enables the APM mode support for the operating system.  |

**APM Configuration**

Use the **APM Configuration** menu (**BIOS Menu 10**) to select the advanced power management.



**BIOS Menu 10: APM Configuration**

**Power Management/APM [Enabled]**

The **Power Management/APM** BIOS option accesses the advanced power management features.

Disabled	Default	Disables the Advanced Power Management (APM) feature
Enabled	Default	Enables the APM feature

**Power Button Mode [On/Off]**

The **Power Button Mode** BIOS specifies how the power button functions.

On/Off	Default	When the power button is pressed the system is either turned on or off
Suspend		When the power button is pressed the system goes into suspend mode

**Restore on AC Power Loss [Last State]**

The Restore on AC Power Loss BIOS option specifies what state the system returns to if there is a sudden loss of power to the system.

Power Off		The system remains turned off
Power On		The system turns on
Last State	Default	The system returns to its previous state. If it was on, it turns itself on. If it was off, it remains off.

**Resume on Ring [Enabled]**

The **Resume on Ring** BIOS option specifies if the system will be roused from a suspended or standby state when there is activity on the RI (ring in) modem line. That is, the system will be roused by an incoming call on a modem.

Disabled		Wake event not generated by an incoming call
Enabled	Default	Wake event generated by an incoming call

**Resume on PME# [Enabled]**

The **Resume on PME#** BIOS option specifies if the system will be roused from a suspended or standby state when there is activity on the PCI PME (power management event) controller.

Disabled		Wake event not generated by PCI PME controller activity
Enabled	Default	Wake event generated by PCI PME controller activity

**Resume On RTC Alarm [Disabled]**

The **Resume On RTC Alarm** determines when the computer will be roused from a suspended state.

Disabled	Default	The real time clock (RTC) cannot generate a wake event
Enabled		If selected, the following will appear with values that can be selected:

**RTC Alarm Date (Days)****System Time**

After setting the alarm, the computer will turn itself on from a suspend state when the alarm goes off.

**Resume On PCI-Express WAKE# [Enabled]**

The **Resume On PCI-Express WAKE#** BIOS option specifies if the system will be roused from a suspended or standby state when there is activity on the PCI-Express controller.

- |                      |   |
|----------------------|---|
| Disabled             | Wake event not generated by PCI-Express controller activity |
| Enabled      Default | Wake event generated by PCI-Express controller activity     |

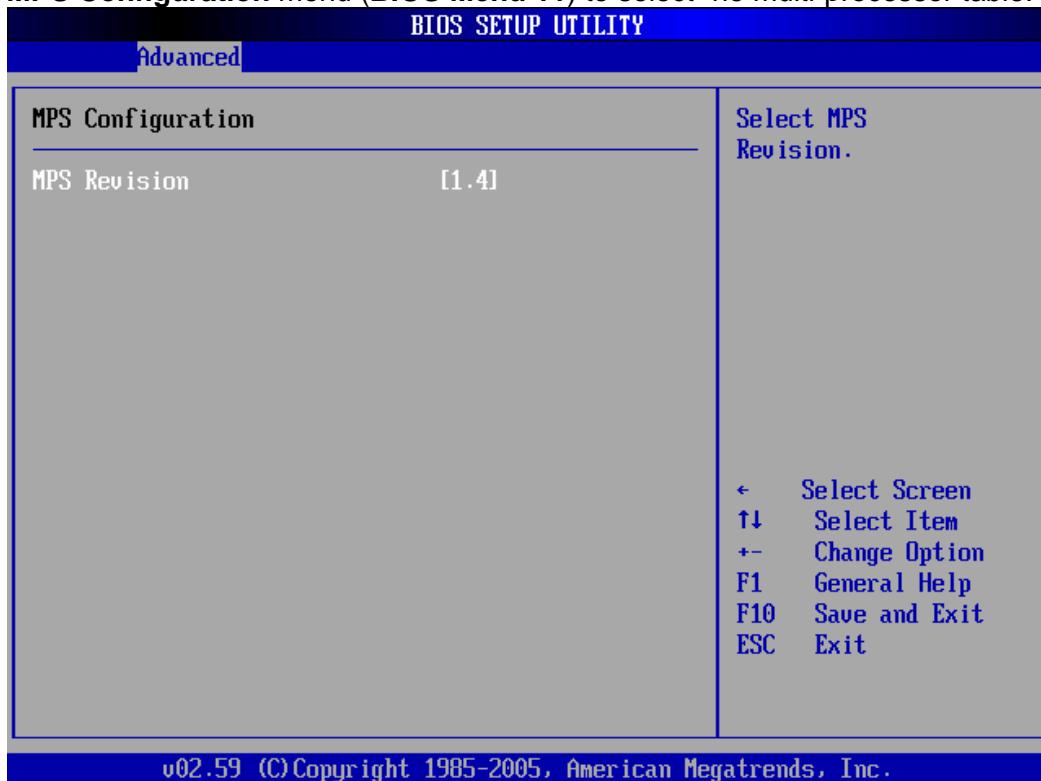
**Power supply mode [AT]**

The **Power supply mode** BIOS option specifies if the system need to running AT type shut-down for customer's special requirement!

- |                 |   |
|-----------------|---|
| AT      Default | For support AT power Supply & AT type shut-down |
| ATX             | For support normally ATX power Supply           |

**MPS Configuration**

Use the **MPS Configuration** menu (**BIOS Menu 11**) to select the multi-processor table.



**BIOS Menu 11: MPS Configuration**

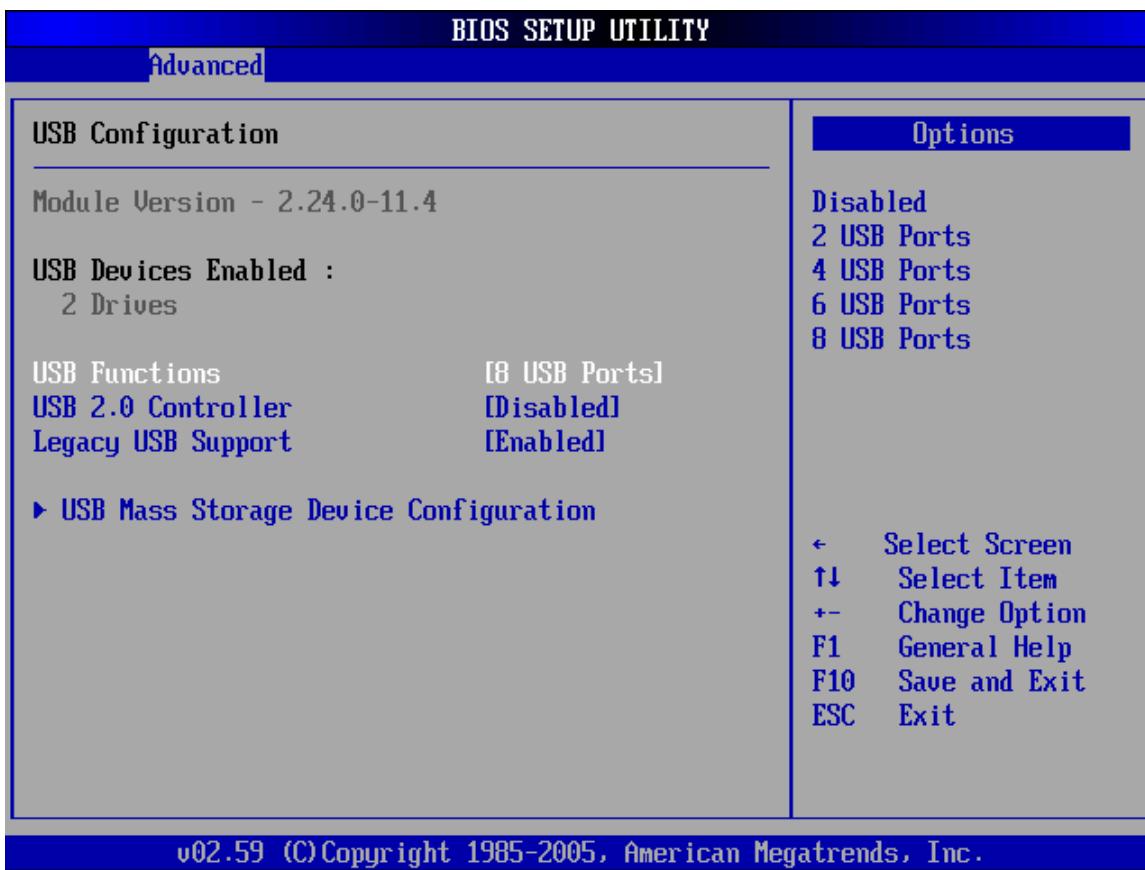
**MPS Revision [1.4]**

Use the **Multiprocessor Specification (MPS) for OS** option to specify the MPS version to be used.

- |             |                         |
|-------------|-------------------------|
| 1.1         | MPS version 1.1 is used |
| 1.4 Default | MPS version 1.4 is used |

**USB Configuration**

Use the **USB Configuration** menu (**BIOS Menu 12**) to read USB configuration information and configure the USB settings.



**BIOS Menu 12: USB Configuration**

**USB Configuration**

The **USB Configuration** field shows the system USB configuration. The items listed are:

**Module Version: x.xxxxx.xxxxx**

**USB Devices Enabled**

The **USB Devices Enabled** field lists the USB devices that are enabled on the system

**USB Function [8 USB Ports]**

Use the **USB Function** BIOS option to disable USB function support or to set the number of USB ports to activate.

Disabled		USB function support disabled
2 USB Ports		Two USB ports are activated.
4 USB Ports		Four USB ports are activated.
6 USB Ports		Six USB ports are activated.
8 USB Ports	Default	Eight USB ports are activated.

**USB 2.0 Controller [Enabled]**

Use the **USB 2.0 Controller** BIOS option to enable or disable the USB 2.0 controller

Enabled	Default	USB 2.0 controller enabled
Disabled		USB 2.0 controller disabled

**Legacy USB Support [Enabled]**

Use the **Legacy USB Support** BIOS option to enable USB mouse and USB keyboard support.

Normally if this option is not enabled, any attached USB mouse or USB keyboard does not become available until a USB compatible operating system is fully booted with all USB drivers loaded. When this option is enabled, any attached USB mouse or USB keyboard can control the system even when there is no USB driver loaded onto the system.

Disabled		Legacy USB support disabled
Enabled	Default	Legacy USB support enabled
Auto		Legacy USB support disabled if no USB devices are connected

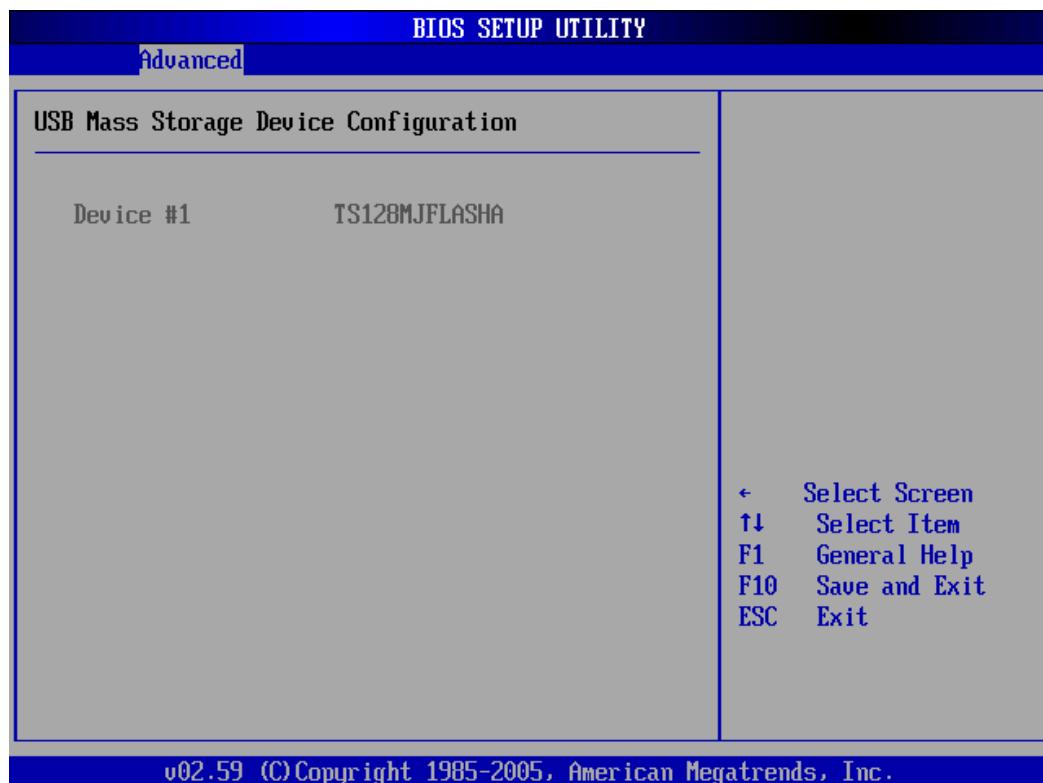
**USB2.0 Controller Mode [FullSpeed]**

Use the **USB2.0 Controller Mode** option to set the speed of the USB2.0 controller.

FullSpeed	Default	The controller is capable of operating full speed
-----------	---------	---

**USB Mass Storage Device Configuration**

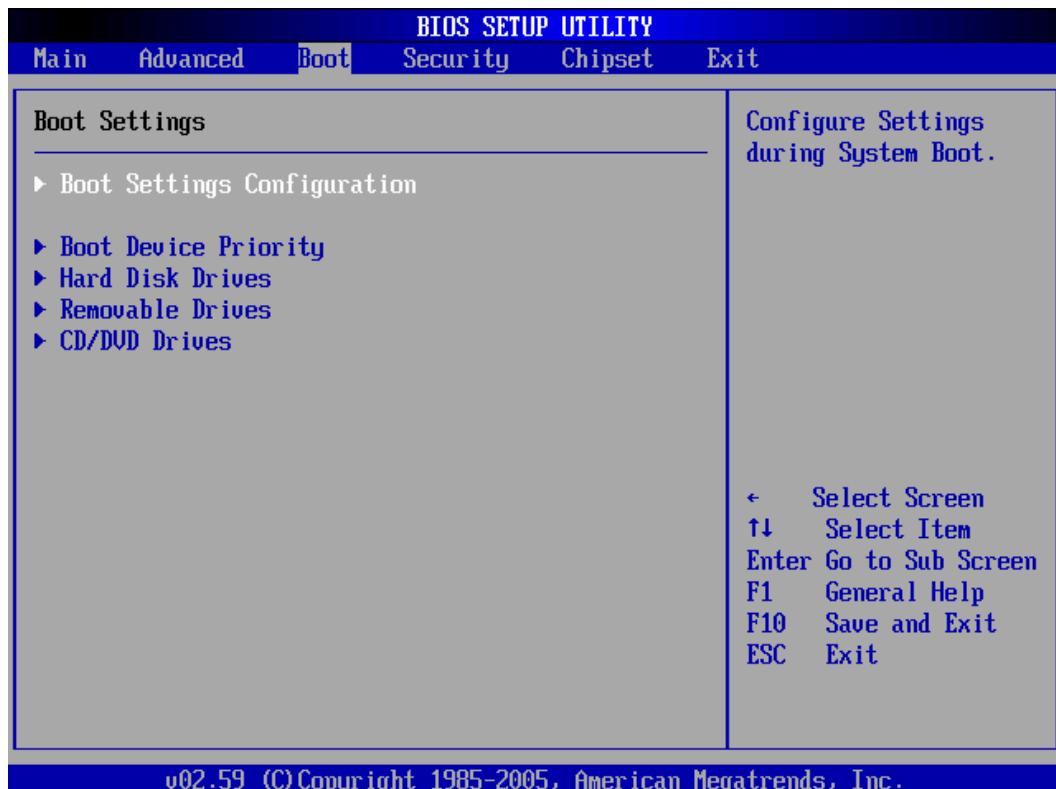
Use the **USB Mass Storage Device Configuration** menu (**BIOS Menu 14**) to configure USB mass storage class devices.

**BIOS Menu 13: USB Mass Storage Device Configuration****Device ##**

The **Device##** field lists the USB devices that are connected to the system.

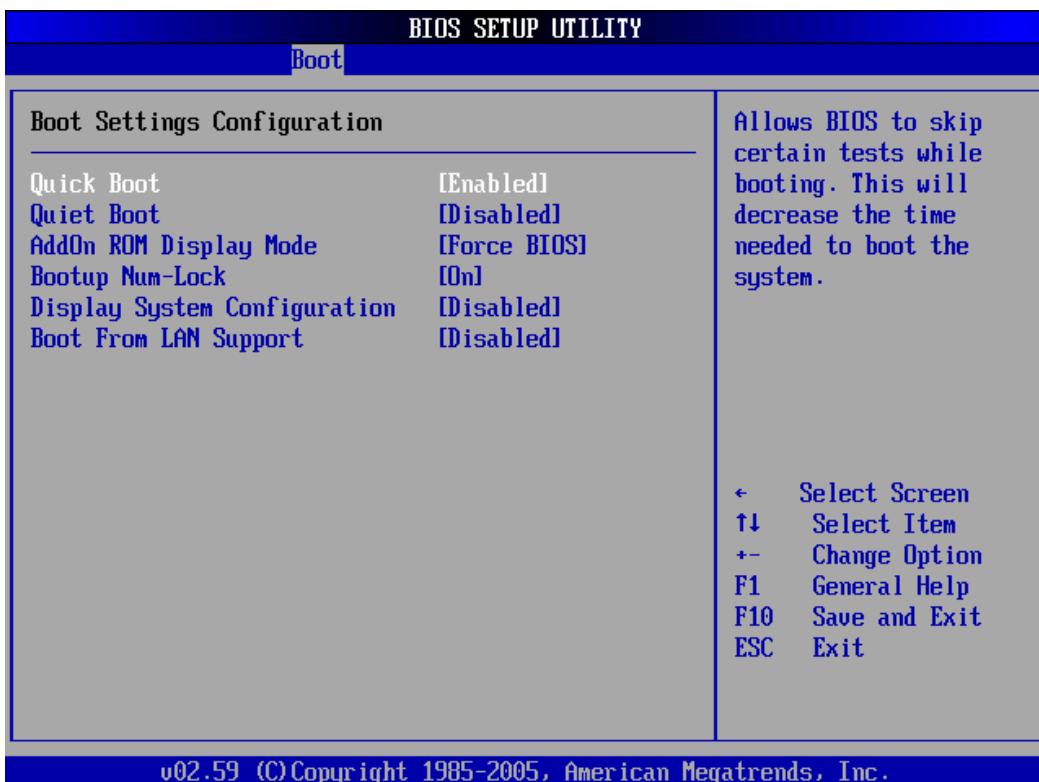
**Boot**

Use the **Boot** menu (**BIOS Menu 14**) to configure system boot options.

**BIOS Menu 14: Boot**

## Boot Settings Configuration

Use the **Boot Settings Configuration** menu (**BIOS Menu 16**) to configure advanced system boot options.



**BIOS Menu 15: Boot Settings Configuration**

### Quick Boot [Enabled]

Use the **Quick Boot** BIOS option to make the computer speed up the boot process.

- |          |                                |   |
|----------|--------------------------------|---|
| Disabled | No POST procedures are skipped |   |
| Enabled  | Default                        | Some POST procedures are skipped to decrease the system boot time |

### Quiet Boot [Disabled]

Use the **Quiet Boot** BIOS option to select the screen display when the system boots.

- |          |         |   |
|----------|---------|---|
| Disabled | Default | Normal POST messages displayed              |
| Enabled  |         | OEM Logo displayed instead of POST messages |

### AddOn ROM Display Mode [Force BIOS]

Use the **AddOn ROM Display Mode** option to allow add-on ROM (read-only memory) messages to be displayed.

Force BIOS	Default	The system forces third party BIOS to display during system boot.
Keep Current		The system displays normal information during system boot.

**Bootup Num-Lock [On]**

Use the **Bootup Num-Lock** BIOS option to specify if the number lock setting must be modified during boot up.

Off		Does not enable the keyboard Number Lock automatically. To use the 10-keys on the keyboard, press the Number Lock key located on the upper left-hand corner of the 10-key pad. The Number Lock LED on the keyboard lights up when the Number Lock is engaged.
On	Default	Allows the Number Lock on the keyboard to be enabled automatically when the computer system boots up. This allows the immediate use of the 10-key numeric keypad located on the right side of the keyboard. To confirm this, the Number Lock LED light on the keyboard is lit.

**Display System Configuration [Disabled]**

Use the **Display System Configuration** BIOS option to enable or disable the display system configuration.

Enabled	Default	The display system configuration is enabled
Disabled		The display system configuration is disabled

**Boot From LAN Support [Disabled]**

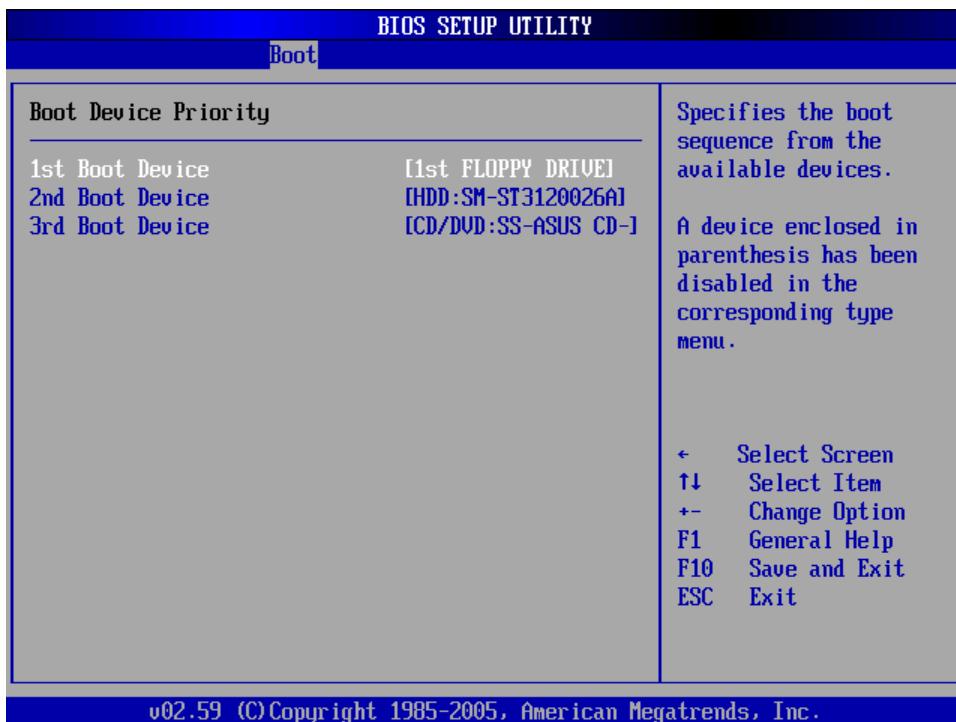
The **BOOT From LAN Support** option enables the system to be booted from a remote system.

Disabled	Default	Cannot be booted from a remote system through the LAN
Enabled		Can be booted from a remote system through the LAN

**Boot Device Priority**

Use the **Boot Device Priority** menu (**BIOS Menu 16**) to specify the boot sequence from the available devices. Possible boot devices may include:

**1<sup>st</sup> FLOPPY DRIVE****HDD****CD/DVD**



#### BIOS Menu 16: Boot Device Priority Settings

#### Hard Disk Drives

Use the **Hard Disk Drives** menu to specify the boot sequence of the available HDDs. When the menu is opened, the HDDs connected to the system are listed as shown below:

**1st Drive**      **[HDD: PM-(part number)]**

	<b>NOTE:</b> Only the drives connected to the system are shown. For example, if only two HDDs are connected only “1st Drive” and “2nd Drive” are listed.
--	---

The boot sequence from the available devices is selected. If the “1st Drive” option is selected a list of available HDDs is shown. Select the first HDD the system boots from. If the “1st Drive” is not used for booting this option may be disabled.

#### Removable Drives

Use the **Removable Drives** menu (**BIOS Menu 17**) to specify the boot sequence of the available FDDs. When the menu is opened, the FDDs connected to the system are listed as shown below:

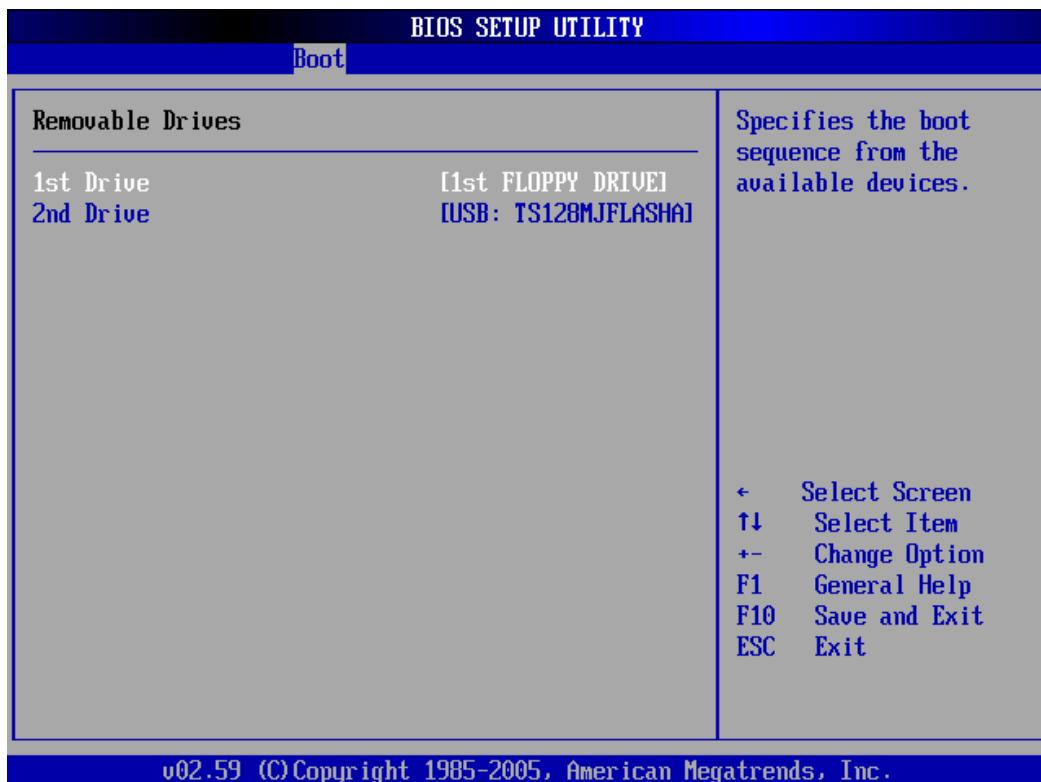
**1st Drive**      **[1st FLOPPY DRIVE]**

**2nd Drive**      **[2nd FLOPPY DRIVE]**

**MoniMax 5600****5. Control Electronics****NOTE:**

Only the drives connected to the system are shown. For example, if only one FDD is connected only “1st Drive” is listed.

The boot sequence from the available devices is selected. If the “1st Drive” option is selected a list of available FDDs is shown. Select the first FDD the system boots from. If the “1st Drive” is not used for booting this option may be disabled.

**BIOS Menu 17: Removable Drives****CD/DVD Drives**

Use the **CD/DVD Drives** menu to specify the boot sequence of the available CD/DVD drives. When the menu is opened, the CD drives and DVD drives connected to the system are listed as shown below:

**1st Drive** [CD/DVD: PM-(part ID)]

**NOTE:**

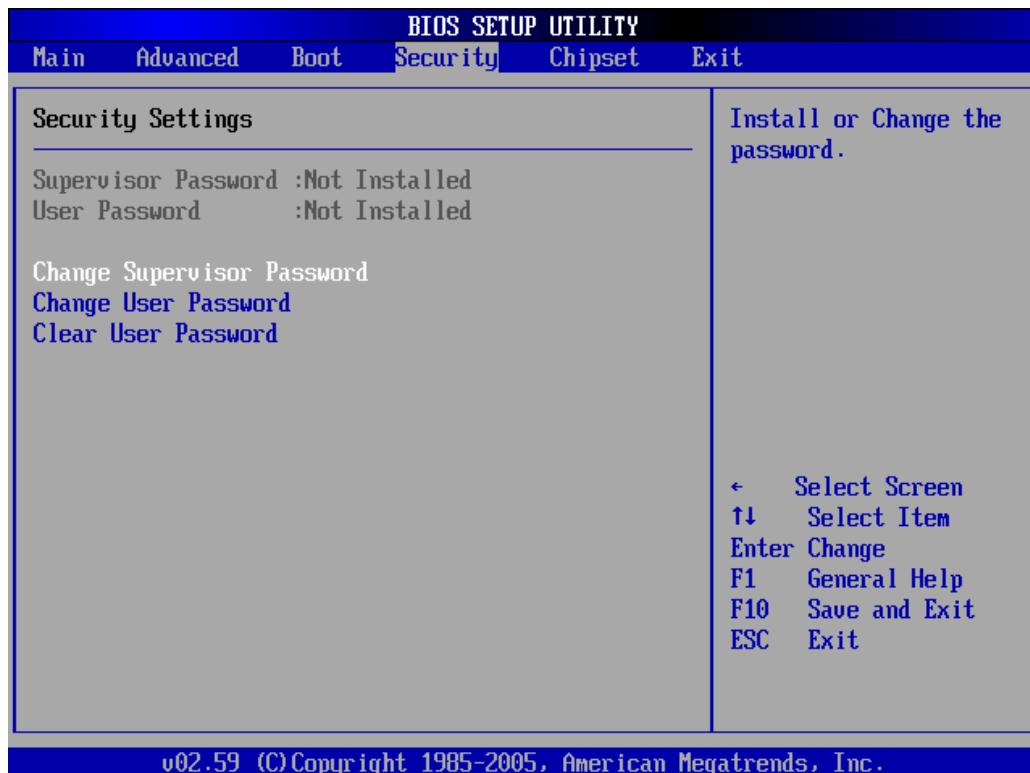
Only the drives connected to the system are shown. For example, if only two CDs or DVDs

	are connected only “1st Drive” and “2nd Drive” are listed.
--	--

The boot sequence from the available devices is selected. If the “**1st Drive**” option is selected a list of available CD/DVD drives is shown. Select the first CD/DVD drive the system boots from. If the “**1st Drive**” is not used for booting this option may be disabled.

## **Security**

Use the **Security** menu (**BIOS Menu 18**) to set system and user passwords.



**BIOS Menu 18: Security**

### **Change Supervisor Password**

Use the Change Supervisor Password to set or change a supervisor password. The default for this option is Not Installed. If a supervisor password must be installed, select this field and enter the password. After the password has been added, Install appears next to Change Supervisor Password.

### **Change User Password**

Use the Change User Password to set or change a user password. The default for this option is Not Installed. If a user password must be installed, select this field and enter the password. After the password has been added, Install appears next to Change User Password.

## Chipset

Use the **Chipset** menu (**BIOS Menu 19**) to access the NorthBridge and SouthBridge configuration menus



### **WARNING!**

Setting the wrong values for the Chipset BIOS selections in the Chipset BIOS menu may cause the system to malfunction.



**BIOS Menu 19: Chipset**

### **Audio Controller [AC'97 Audio Only],**

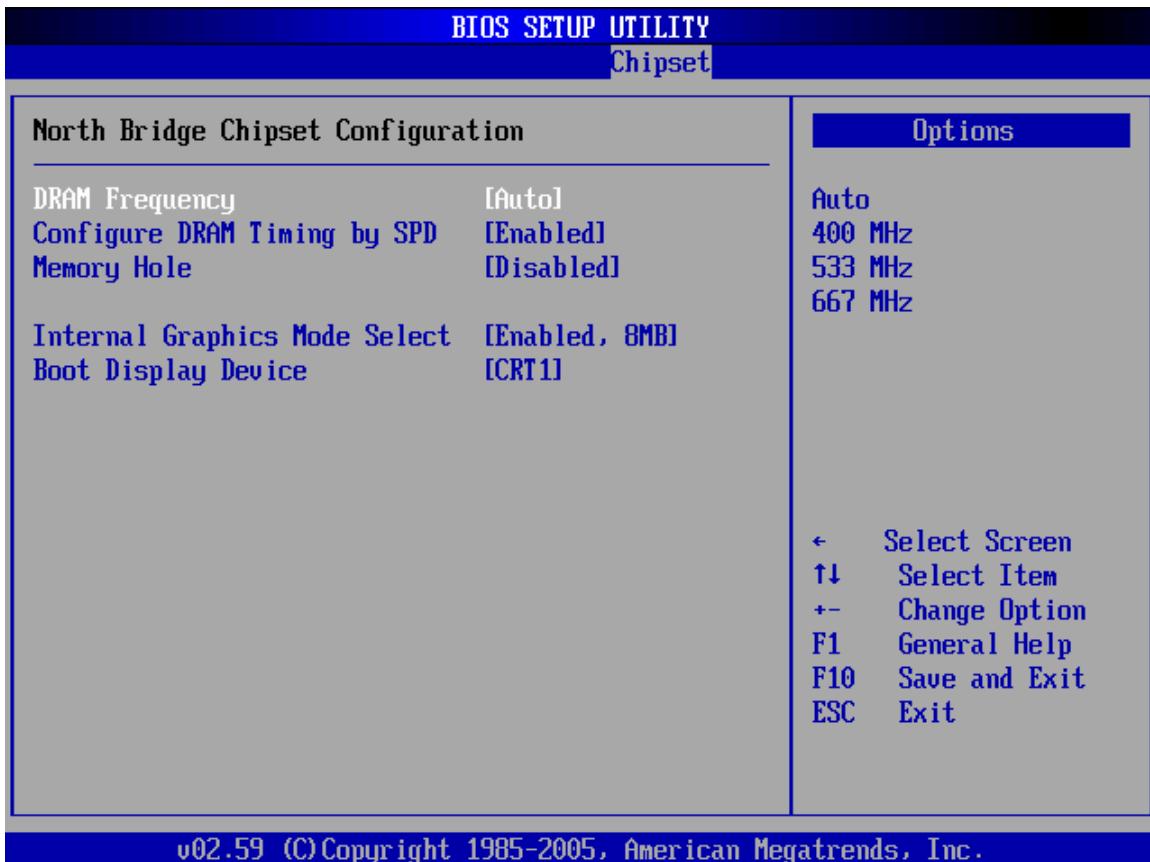
Use the **Audio Controller** option to select the audio specification to apply on the system.

AC'97 Audio Only Default The audio specification is set to AC' 97 CODEC only.

All Disabled All the audio specifications are disabled.

## North Bridge Configuration

Use the **NorthBridge Configuration** menu (**BIOS Menu 21**) to configure the northbridge chipset.



BIOS Menu 20:NorthBridge Chipset Configuration

### DRAM Frequency [Auto]

Use the **DRAM Frequency** option to specify the DRAM frequency or allow the system to automatically detect the DRAM frequency.

Auto	Default	Automatically selects the DRAM frequency
400MHz		Sets the DRAM frequency to 400MHz
533MHz		Sets the DRAM frequency to 533MHz
667MHz		Sets the DRAM frequency to 667MHz

### Configure DRAM Timing by SPD [Enabled]

Use the **Configure DRAM Timing by SPD** option to determine if the system uses the SPD (Serial Presence Detect) EEPROM to configure the DRAM timing. The SPD EEPROM contains all necessary DIMM specifications including the speed of the individual components such as CAS and bank cycle

time as well as valid settings for the module and the manufacturer's code. The SPD enables the BIOS to read the spec sheet of the DIMMs on boot-up and then adjust the memory timing parameters accordingly.

Disabled	DRAM timing parameters are manually set using the DRAM sub-items
Enabled Default	DRAM timing parameter are set according to the DRAM Serial Presence Detect (SPD)

If the **Configure DRAM Timing by SPD** option is disabled, the following configuration options appear.

- DRAM CAS# Latency [3]
- DRAM RAS# to CAS# Delay [5 DRAM Clocks]
- DRAM RAS# Precharge [5 DRAM Clocks]
- DRAM RAS# Activate to Precha [15 DRAM Clocks]

#### **Memory Hole [Disabled]**

Use the **Memory Hole** option to reserve memory space between 15MB and 16MB for ISA expansion cards that require a specified area of memory to work properly. If an older ISA expansion card is used, please refer to the documentation that came with the card to see if it is necessary to reserve the space.

Disabled	Default	Memory is not reserved for ISA expansion cards
15MB – 16MB		Between 15MB and 16MB of memory is reserved for ISA expansion cards

#### **Initiate Graphic adaptor [IGD]**

Use the **Initiate Graphic adaptor** option to specify first initial graphic adaptor.

IGD	Default	Initial on-board VGA first
PCI/IGD		Initial PCI VGA card first

#### **Internal Graphics Mode Select [Enable, 8MB]**

Use the **Internal Graphic Mode Select** option to specify the amount of system memory that can be used by the Internal graphics device.

Disable		
Enable, 1MB		1MB of memory used by internal graphics device
Enable, 8MB	Default	8MB of memory used by internal graphics device

#### **Boot display device [CRT1]**

Use the **Boot display device** option to specify boot up monitor

CRT1	Default	Boot up form CRT1 connector
CRT1 + CRT2		Boot up form both of CRT1 & CRT2 connector

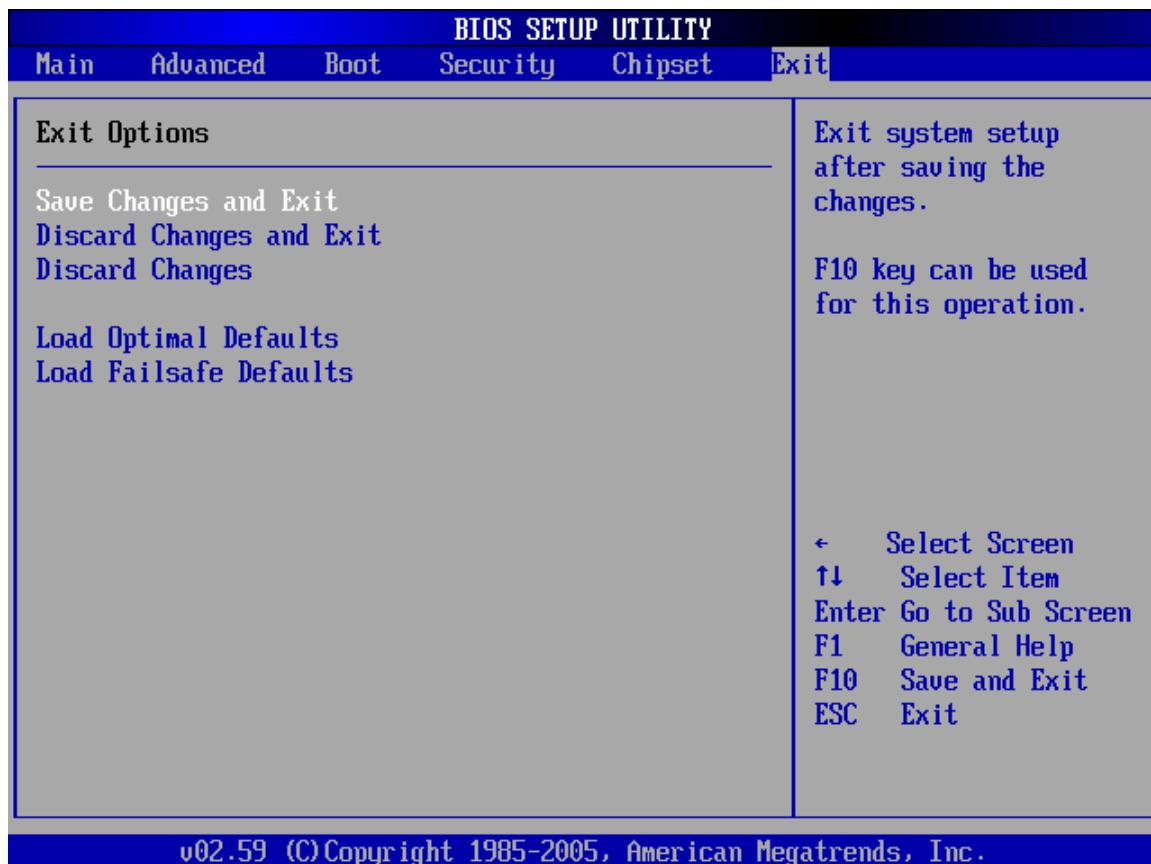
**MoniMax 5600****5.Control Electronics**

CRT2

Boot up from CRT1 connector

**Exit**

Use the **Exit** menu (**BIOS Menu 21**) to load default BIOS values, optimal failsafe values and to save configuration changes.

**BIOS Menu 21:Exit****Save Changes and Exit**

Use the **Save Changes and Exit** option to save the changes made to the BIOS options and to exit the BIOS configuration setup program.

**Discard Changes and Exit**

Use the **Discard Changes and Exit** option to exit the BIOS configuration setup program without saving the changes made to the system.

### **Discard Changes**

Use the **Discard Changes** option to discard the changes and remain in the BIOS configuration setup program.

### **Load Optimal Defaults**

Use the **Load Optimal Defaults** option to load the optimal default values for each of the parameters on the Setup menus. **F9 key can be used for this operation.**

### **Load Failsafe Defaults**

Use the **Load Failsafe Defaults** option to load failsafe default values for each of the parameters on the Setup menus. **F8 key can be used for this operation.**

## Jumper Setting

### Clear CMOS Setting

To clear the CMOS Setup (for example if you have forgotten the password, you should clear the CMOS and then re-set the password), you should close the CLR\_CMOS1(2-3) for about 3 seconds, then open it once more. This will set back to normal operation mode.

CLR\_CMOS1 : Clear CMOS Setup

	CLR_CMOS1	DESCRIPTION
1	1-2 (default)*	Keep CMOS Setup (Normal operation)
	2-3	Clear CMOS Setup

COM1 Port RI and Voltage Selection

	J_COM_F1	DESCRIPTION
1	2-3	COM1 RI Pin Use RI
	1-2	COM1 RI Pin Use Voltage

	J_COM_V1	DESCRIPTION
1	2-3	COM1 RI Pin Use Voltage 12V
	1-2	COM1 RI Pin Use Voltage 5V

### COM port Setting

COM2 Port RI and Voltage Selection

	J_COM_F2	DESCRIPTION
1	2-3	COM2 RI Pin Use RI
	1-2	COM2 RI Pin Use Voltage

	J_COM_V2	DESCRIPTION
1	2-3	COM2 RI Pin Use Voltage 12V
	1-2	COM2 RI Pin Use Voltage 5V

COM3 Port RI and Voltage Selection

	J_COM_F3	DESCRIPTION
1	2-3	COM3 RI Pin Use RI
	1-2	COM3 RI Pin Use Voltage

	J_COM_V3	DESCRIPTION
1	2-3	COM3 RI Pin Use Voltage 12V
	1-2	COM3 RI Pin Use Voltage 5V

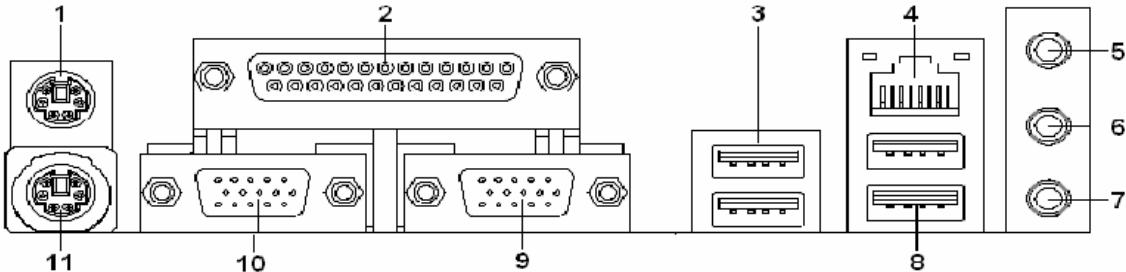
## MoniMax 5600

## 5.Control Electronics

## COM port Setting

COM4 Port RI and Voltage Selection	
	DESCRIPTION
1	J_COM_F4
2-3	COM4 RI Pin Use RI
1-2	COM4 RI Pin Use Voltage
1	J_COM_V4
2-3	COM4 RI Pin Use Voltage 12V
1-2	COM4 RI Pin Use Voltage 5V

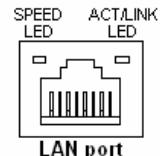
## Connectors



- 1. PS/2 mouse port.** This port is for a PS/2 mouse.
- 2. Parallel port.** This 25-pin port connects a parallel printer, a scanner, or other devices
- 3. USB 2.0 ports 3 and 4.** These two 4-pin Universal Serial Bus (USB) ports are available for connecting USB 2.0 devices.
- 4. LAN (RJ-45) port.** This port allows Gigabit connection to Local Area Network (LAN) through a network hub. Refer to the table below for the LAN port LED indication.

## LAN port LED indications

SPEED LED		ACT/LINK LED	
Status	Description	Status	Description
OFF	10 Mbps connection	OFF	No link
ORANGE	100 Mbps connection	YELLOW	Linked
GREEN	1 Gbps connection	BLINKING	Date activity



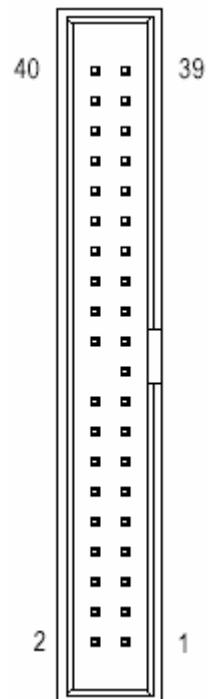
- 5. Line In port.** This port connects a CD ,DVD player, or other audio devices.
- 6. Line Out port.** This port connects a headphone or a speaker. In 4,6,8-channel configuration, the function of this port becomes Front Speaker Out.
- 7. Microphone port.** This port connects a microphone.
- 8. USB 2.0 ports 1 and 2.** These two 4-pin Universal Serial Bus (USB) ports are available for connecting USB 2.0 devices.
- 9. VGA2 port .** This 15-pin Secondary VGA port connects to a VGA monitor.
- 10. VGA1 port .** This 15-pin Primary VGA port connects to a VGA monitor.
- 11. PS/2 Keyboard port.** This port is for PS/2 keyboard.

**MoniMax 5600****5.Control Electronics****PCI E-IDE Disk Drive Connector**

One IDE connector can connect to one IDE cable, and the single IDE cable can then connect to two IDE devices.

- IDE : IDE1 Connector .

<b>PIN</b>	<b>DESCRIPTION</b>	<b>PIN</b>	<b>DESCRIPTION</b>
1	RESET#	2	GND
3	DATA 7	4	DATA 8
5	DATA 6	6	DATA 9
7	DATA 5	8	DATA 10
9	DATA 4	10	DATA 11
11	DATA 3	12	DATA 12
13	DATA 2	14	DATA 13
15	DATA 1	16	DATA 14
17	DATA 0	18	DATA 15
19	GND	20	(KEY)
21	DRQ	22	GND
23	IOW#	24	GND
25	IOR#	26	GND
27	CHRDY	28	GND
29	DACK	30	GND
31	INTERRUPT	32	N/C
33	SA1	34	P66DET
35	SA0	36	SA2
37	HDC CS0#	38	HDC CS1#
39	HDD ACTIVE#	40	GND

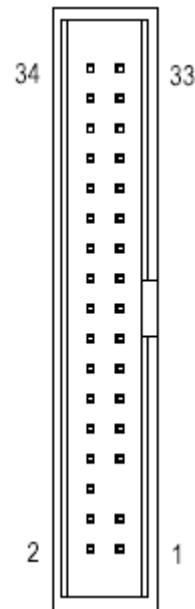


**MoniMax 5600****5.Control Electronics****Floppy Connector**

The FDD1 connector is used to connect the FDD cable while the other end of the cable connects to the FDC drive. The types of FDD drives FDC drivers supported are:360KB, 720KB, 1.2MB, 1.44MB and 2.88MB. Please connect the red power connector wire to the pin1 position.

- FDc1 : Floppy Connector .

PIN	DESCRIPTION	PIN	DESCRIPTION
1	GND	2	RWC0-
3	GND	4	NC
5	NC	6	NC
7	GND	8	INDEX-
9	GND	10	MO-A
11	GND	12	DS-B
13	GND	14	DS-A
15	GND	16	MO-B
17	GND	18	DIR-
19	GND	20	STEP-
21	GND	22	WD-
23	GND	24	WGATE-
25	GND	26	TRK0-
27	GND	28	WP-
29	GND	30	RDATA-
31	GND	32	HEAD-
33	GND	34	DSKCHG-

**Serial Port connector**

The Board offers Six high speed NS16C550 compatible UART's with 16-byte Read/Receive FIFO serial ports.

- COM1,2 : 10-Pin Serial Port Connector.

PIN	DESCRIPTION	PIN	DESCRIPTION
1	DCD	2	DSR
3	RXD	4	RTS
5	TXD	6	CTS
7	DTR	8	RI/Voltage
9	GND	10	NC

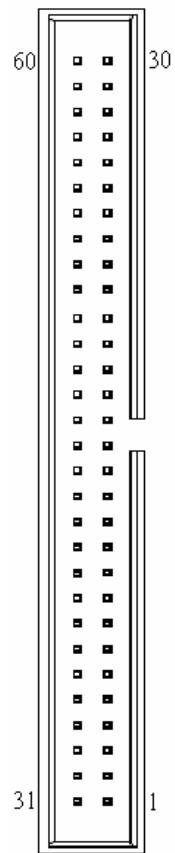


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**MoniMax 5600****5. Control Electronics**

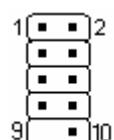
JCOM345678 : 60-Pin Serial Port Connector.

PIN	DESCRIPTION	PIN	DESCRIPTION
1	DCD3	31	DSR3
2	RXD3	32	RTS3
3	TXD3	33	CTS3
4	DTR3	34	RI3/Voltage
5	GND	35	NC
6	DCD4	36	DSR4
7	RXD4	37	RTS4
8	TXD4	38	CTS4
9	DTR4	49	RI4/Voltage
10	GND	40	NC
11	DCD5	41	DSR5
12	RXD5	42	RTS5
13	TXD5	43	CTS5
14	DTR5	44	RI5
15	GND6	45	NC
16	DCD6	46	DSR6
17	RXD6	47	RTS6
18	TXD6	48	CTS6
19	DTR6	49	RI6
20	GND	50	NC
21	DCD7	51	DSR7
22	RXD7	52	RTS7
23	TXD7	53	CTS7
24	DTR7	54	RI7
25	GND	55	NC
26	DCD8	56	DSR8
27	RXD8	57	RTS8
28	TXD8	58	CTS8
29	DTR8	59	RI8
30	GND	60	NC

**USB Port Connector**

- USB2,3 : 2 ports USB Connector.

PIN	DESCRIPTION	PIN	DESCRIPTION
1	VCC	2	VCC
3	DATA0-	4	DATA1-
5	DATA0+	6	DATA1+
7	GND	8	GND
9	KEY	10	NC



### Fan Connector

The IOBP-945G-SEL also has a CPU with cooling fan connector and chassis fan connector, which can supply 12V to the cooling fan. There is a “sense” pin in the fan connector, which transfers the fan’s sense signal to the system BIOS in order to recognize the fan speed. Please note that only some specific types of fans offer a rotation signal.

- CPU\_FAN1 : Fan Connector.

PIN	DESCRIPTION
1	GND
2	+12V
3	Sense
4	Speed control



- SYS\_FAN1 : Fan Connector.

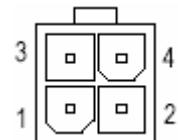
PIN	DESCRIPTION
1	GND
2	+12V
3	Sense

### CPU Power Connector

The CPU12V1 power connector main supplies power to the CPU. If the CPU12V1 power connector is not connected, the system will not start.

- CPU12V1 : CPU Power Connector.

PIN	DESCRIPTION	PIN	DESCRIPTION
1	GND	2	GND
3	+12V	4	+12V

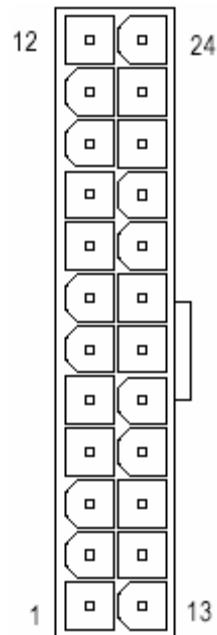


### Power Connector

With the use of the power connector, the power supply can enough stable power all the components on the motherboard. Before connecting the power connector, please make sure that all components are properly installed.

- PWR1 : Power Connector.

PIN	DESCRIPTION	PIN	DESCRIPTION
1	3.3V	13	3.3V
2	3.3V	14	-12V
3	GND	15	GND
4	+5V	16	PS_ON
5	GND	17	GND
6	+5V	18	GND
7	GND	19	GND
8	Power good	20	-5V
9	5VSB	21	+5V
10	+12V	22	+5V
11	+12V	23	+5V
12	3.3V	24	GND

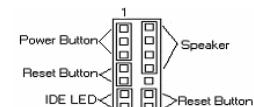


### Front Panel Jumper

Please connect the power LED, PC speaker, reset switch and power switch etc of your chassis front panel to the CN1 connector according to the pin assignment below.

- CN1: Front Panel Jumper

PIN	DESCRIPTION	PIN	DESCRIPTION
1	Power LED+	2	Speaker+
3	NC	4	NC
5	Power LED-	6	NC
7	Power Button+	8	Speaker-
9	Power Button-	10	NC
11	IDE LED+	12	Reset Button+
13	IDE LED-	14	Reset Button-

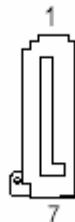


**MoniMax 5600****5.Control Electronics****Serial ATA Connector**

This connectors are for the Serial ATA signal cable for Serial ATA hard disk drives.

- SATA1, 2, : Serial ATA Connector.

PIN	DESCRIPTION
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND



### **5.3.2 HDD**

#### **FEATURES**

- Max. 160GB Formatted Capacity Per Disk
- Serial ATA 3.0Gbps Interface Support
- SATA Native Command Queuing Feature set
- On-the-fly(OTF) error correction
- Supports all logical geometries as programmed by the host
- Fluid Bearing Spindle Motor Technology
- Noise predictive PRML read channel
- Dynamic anti-stiction algorithm
- ATA S.M.A.R.T. Compliant
- ATA Automatic Acoustic Management Feature Set
- ATA 48-bit Address Feature Set
- ATA Streaming Feature Set(Optional)
- ATA Device Configuration Overlay Feature Set
- NoiseGuard™
- SilentSeek™

#### **DRIVE CONFIGURATION**

Interface Serial ATA : 3.0Gbps

Buffer DRAM Size : 2 / 8 MB

Bytes per Sector : 512

#### **PERFORMANCE SPECIFICATIONS**

Read Seek Time (typ.)

Track to Track : 0.8 ms

Average : 8.9 ms

Full Stroke : 18 ms

Average Latency : 4.17 ms

Rotational Speed : 7,200 RPM

Data Transfer Rate

## MoniMax 5600

## 5. Control Electronics

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Media to/from Buffer (max.) : 300 MB/sec

Buffer to/from Host (max.) : 967 Mbits/sec

Drive Ready Time (typ.) : 8 sec

### RELIABILITY SPECIFICATIONS

Non-recoverable Read Error : 1 sector in  $10P^{14}$  bits

MTBF : 600,000 POH

Start/Stop Cycles (Ambient) : 50,000

Component Design Life : 5 years

### ACOUSTICS (AVERAGE SOUND POWER)

Idle : 2.45 Bel

Performance Seek : 2.80 Bel

Quiet Seek : 2.75 Bel

### PHYSICAL DIMENSION

Height : 1 in

Width : 4 in

Depth : 5.75 in

Weight    40/80GB    0.99

            120/160GB    1.02

Note)

1) Specifications are subject to change without notice.

2) 1MB=1,000,000 Bytes,   1GB=1,000,000,000 Bytes.

Accessible capacity may vary depending on operating environment and formatting

3) 7,200 RPM class. Actual speed can be different a little.

4) Averaged value with a high performance cover.

5) Random seek with 30% duty cycle.

6) Power consumption with/without slumber mode.

## MoniMax 5600

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### 5.3.3 ODD

#### General specifications

- (1) Interface : P-ATA
- (2) Disc Diameter : 8cm/ 12cm
- (3) Loading Type : Motorized Tray
- (4) Drive Mounting : Horizontal / Vertical
- (5) Physical Spec : 148.2mm(W) x170mm(D) x42mm(H)
- (6) Buffer Under Run : Buffer Under Run Free Technology used
- (7) Buffer Size : 2MB
- (8) Power Consumption : DC+5V / 1A, DC +12V / 1.5A

#### Performance

##### **(1) Burst Transfer Rate:**

PIO Mode 4 Max 16.6MB/sec

UDMA 4 Max 66.6 MB/sec

##### **(2) Sustain Transfer Rate:**

CD-ROM Max 7.2 MB/sec (48X)

CD-R Read (Mode1) Max 6MB/sec (40x)

CD-RW Read (Mode1) Max 6MB/sec (40x)

DVD-Single ReadMax 21.6MB/sec (16X)

DVD-Dual ReadMax 16.2MB/sec (12X)

DVD-RAM ReadMax 16.2MB/sec (12X)

##### **(3) Read Speed:**

CD-DA (Audio Play) CAV 16X (Max) Analog/Digital audio Playback

Stamped CD-DA (DAE) CAV 40X

Stamped CD-ROMCAV48X(Max)

CD-RCAV 40X (Max)

CD-RWCAV 40X (Max)

Mixed CD (Data, Audio) CAV 40X (Max)

Enhanced CD (Data, Audio) CAV 40X (Max)

Photo-CD/Extra-CD CAV 40X (Max)

Video-CDCAV 16X (Max)

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DVD-Video Play (Single) CAV 6X (Max)  
DVD-Video Play (Dual) CAV 6X (Max)  
DVD-Single CAV 16X (Max)  
DVD-Dual CAV 12X (Max)  
DVD±R CAV 16X (Max)  
DVD±RW ReadCAV12X (Max)  
DVD-RAM ReadCAV12X (Max)  
DVD±R DL CAV 12X (Max)  
TOC Read (CD/DVD) CLV 4X / CLV 2X  
Pause (CD/DVD)CLV 8X / CAV 6X

**(4) Unbalance:**

0.3 gcmCAV 48X (CD), CAV 16X (DVD)  
0.5gcm CAV 24X (CD), CAV 6X (DVD)  
0.75gcm CAV 24X (CD), CAV 6X (DVD)  
1.0gcm CAV 16X (CD), CAV 6X (DVD)

**(5) Eccentricity**

70um(50um) CAV 48X (CD)  
140um(100um) CAV 24X (CD), CAV 6X (DVD)  
Over 210um CAV 16X (CD), CAV 6X (DVD)

**(6) Write Speed:**

CD-R Max 48X (CAV) Max 7.2MB/sec  
CD-RW Max 32X (CAV) Ultra Speed CD-RW Disc  
DVD±R Max 20X (CAV) Max 27MB/sec  
DVD+RW Max 8X (Z-CLV) Max 10.8MB/sec  
DVD-RW Max 6X (CLV) Max 8.1MB/sec  
DVD-RAM Max 12X (CAV) Max 16.2MB/sec  
DVD±R DL Max 12X (Z-CLV) Max 16.2MB/sec

**(7) CPU Utilization:**

CD & DVD (PIO Mode 4) 85% (Max) Typically Stamped CD/DVD Disc

**(8) Spin Up Time:**

From Spindle Stop to Max Speed (CD/DVD) : 7sec(Typ) Stamped CD/DVDLead-in (1session)  
(CD/DVD) : 15sec (Typ) Stamped CD/DVD

**(9) Spin Down Time:**

From Max Speed to Spindle Stop (CD/DVD) : 5.5 sec (Typ) Spin Down & Eject (CD/DVD) : 7sec (Typ)

**(10) Access Time:**

1/3 Stroke

CD/R/RW 130ms (STD-200 Disc)

DVD Single 150ms (TDV-520/STD-NH)

DVD Dual/±R DL 180ms (STD-1100)

DVD±R/±RW 160ms (TDV-520/STD-NH)

DVD-RAM 230ms (Full Write Media)

Random

CD/R/RW 130ms (STD-200 Disc)

DVD Single 150ms (TDV-520/STD-NH)

DVD Dual/±R DL 180ms (STD-1100)

DVD±R/±RW 160ms (TDV-520/STD-NH)

DVD-RAM 230ms (Full Write Media)

Full Stroke

CD/R/RW 210ms (STD-200 Disc)

DVD Single 230ms (TDV-520/STD-NH)

DVD Dual/±R DL 250ms (STD-1100)

DVD±R/±RW 250ms (TDV-520/STD-NH)

DVD-RAM 300ms (Full Write Media)

**(11) Lead-in Time:**

CD Stamp, CD-DA Max 17sec STD-200 Disc

CD-R/RW Max 20sec STD-200 Copy

DVD-Single Max 18sec TDV-520/STD-NH

DVD-Dual Max 18sec STD-1100

DVD±R Max 25sec TDV-520/ STD-NH

DVD±RW Max 25sec TDV-520/ STD-NH

DVD±R DL Max 32sec

DVD RAM Max 45sec

## 5.4 ECS EG31M

### 5.4.1 G31 Main Board

It is an industrial mainboard using Intel G31 chipset(north bridge) + ICH7 chipset(south bridge), acting as the main processor of ATM system CE module. Various units are controlled as they interact with each other over such interfaces as USB, Serial, LAN, VGA, DVI, PCI, IDE, SATA..



Fig.5.2 External Appearance

**MoniMax 5600****5. Control Electronics****5.4.1.1 Functional Description****Specifications**

<b>Overview</b>	
<b>TG Model Name</b>	Memphis
<b>Vendor &amp; Model</b>	ECS EG31M V1.0
<b>System BIOS</b>	AMI BIOS with 8Mbit SPI ROM
<b>PCB Dimension</b>	mATX type, 244mm x 244mm, 4 layers
<b>CPU &amp; Chipset</b>	
<b>Processor</b>	Intel LGA 775 Socket, FSB 800/1066/1333MHz
<b>Processor Families</b>	Intel Celeron 4xx / Pentium Dual Core E2xxx / Core2 Duo / Core2 Quad CPUs
<b>Integrated Graphics</b>	Intel GMA 3100
<b>Memory</b>	DDR2 667/800MHz, 4G Max
<b>DIMM Socket</b>	1.8V 240Pin DIMM Socket x 2ea (Dual Channel)
<b>North Bridge</b>	Intel G31 (A2 stepping, w/ heat sink)
<b>South Bridge</b>	Intel ICH7 (A1 stepping, w/o heat sink)
<b>Super I/O</b>	ITE 8718F-S
<b>LAN</b>	Realtek RTL8111B, 10/100/1000Mbps
<b>Audio</b>	Realtek ALC888S, 8ch
<b>PWM IC</b>	ISL 6312CRZ
<b>Add-in Slot</b>	
	1 PCI Express x16, 1 PCI Express x1, 2 PCI
<b>Rear Panel I/O</b>	
	4 USB ports, 2 PS/2 ports, 1 Parallel port, 1 Serial port, 1 D-sub connector, 6 Audio ports, 1 RJ-45 connector
<b>Internal Header</b>	
	1 ATX power supply connector (2x12, White) 1 12V connector (2x2, White) 1 Floppy connector (White) 1 IDE connector (Blue, Ultra DMA-33/66/100/133) 4 S-ATA connector (S-ATA1&2) 1 Chassis main panel header (2x5, Black) 2 Front panel USB header (2x5, White) 1 Front panel AUDIO header (2x5, Green) 1 Front panel HD audio header (2x8, Black) 1 S/PDIF Audio Front panel header (1x4, Black) 1 CD_IN header (1x4, Black) 1 serial port header (2x5, Green) 1 CIR header (2x5, White) 1 CMOS clear header (1x3, Red) 1 CPU FAN connector (1x4, w/ control) 1 System FAN connector (1x3, w/ control)

## Block Diagram

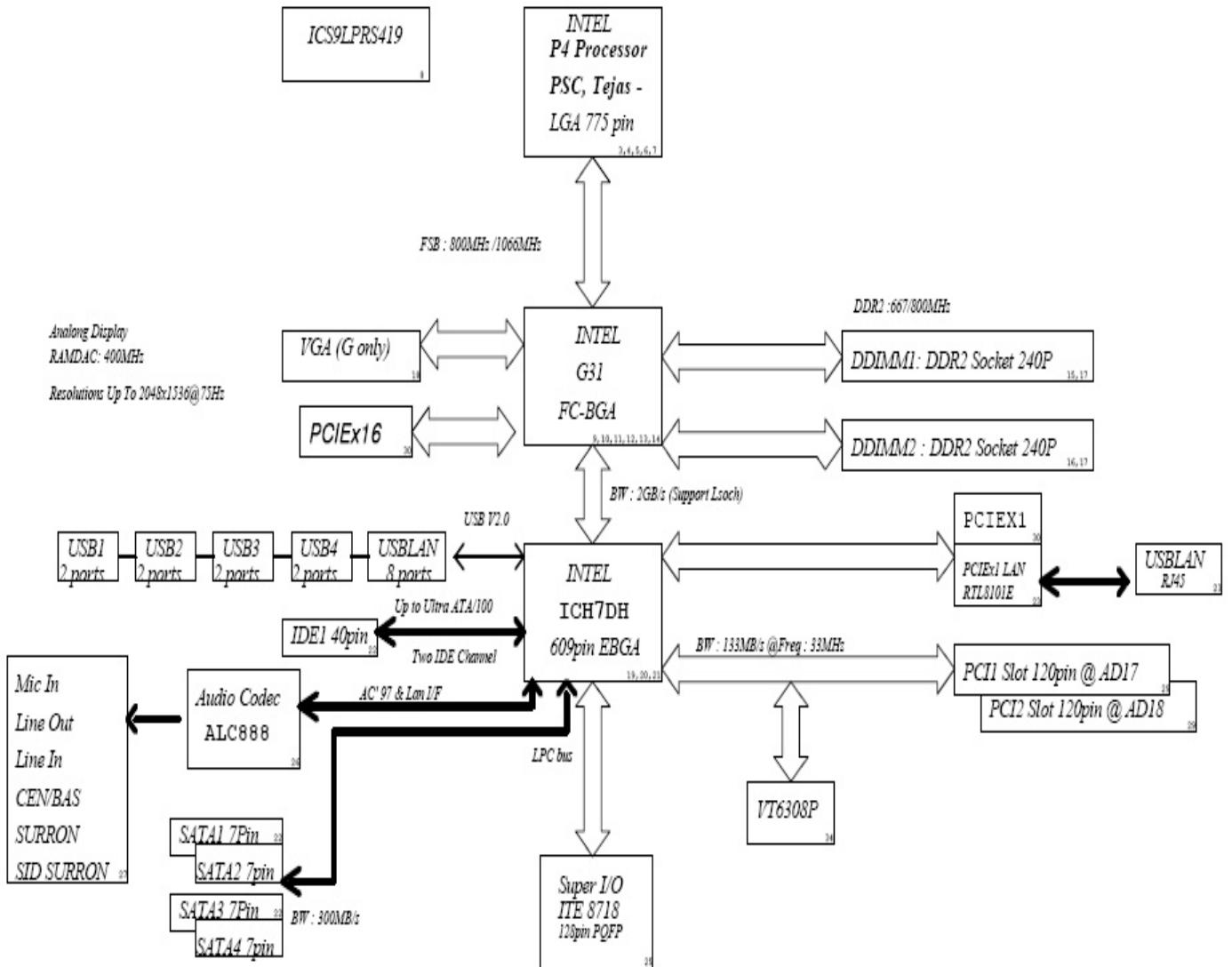


Fig. 5.3

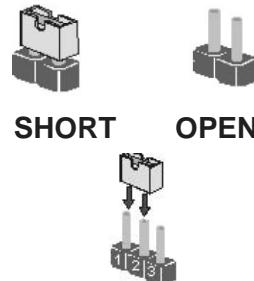
### 5.4.1.2 Jumper setting

This section explains how to set jumpers for correct configuration of the motherboard.

#### Setting Jumpers

Use the motherboard jumpers to set system configuration options. Jumpers with more than one pin are numbered.

When setting the jumpers, ensure that the jumper caps are placed on the correct pins.

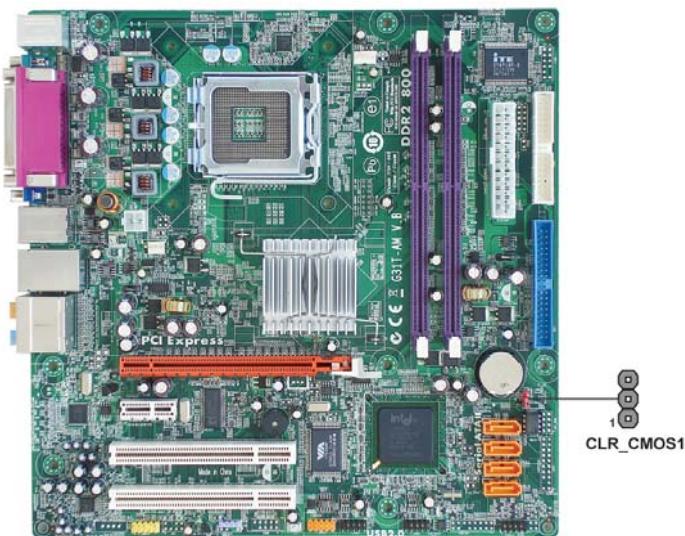


The illustrations show a 2-pin jumper. When the jumper cap is placed on both pins, the jumper is SHORT. If you remove the jumper cap, or place the jumper cap on just one pin, the jumper is OPEN.

This illustration shows a 3-pin jumper. Pins 1 and 2 are SHORT.

#### Checking Jumper Setting

The following illustration shows the location of the motherboard jumpers. Pin 1 is labeled.



#### Jumper Settings

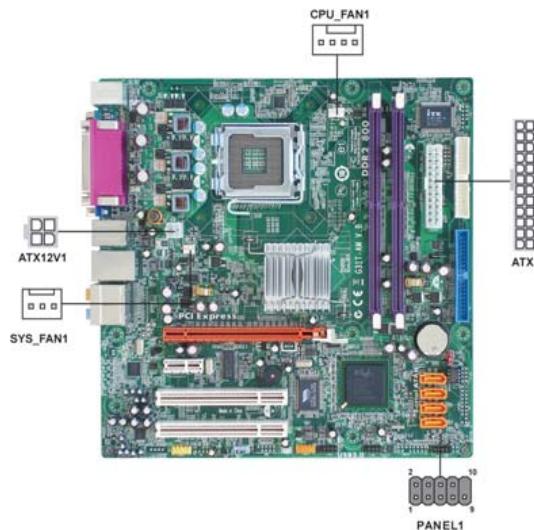
Jumper	Type	Description	Setting (default)
CLR_CMOS1	3-pin	Clear CMOS	1-2: NORMAL 2-3: CLEAR  CMOS Before clearing the CMOS, make sure to turn off the system.

#### 5.4.1.3 Connecting Component

##### Connecting Case Component

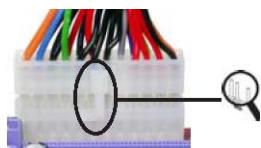
After you have installed the motherboard into a case, you can begin connecting the motherboard components. Refer to the following

1 Connect the CPU cooling fan cable to **CPU\_FAN1**. 2 Connect the system cooling fan connector to **SYS\_FAN1**. 3 Connect the case switches and indicator LEDs to the **PANEL1**. 4 Connect the standard power supply connector to **ATX1**. 5 Connect the auxiliary case power supply connector to **ATX12V1**.



Users please note that the 20-pin and 24-pin power cables can both be connected to the ATX1 connector. With the 20-pin power cable, just align the 20-pin power cable with the pin 1 of the ATX1 connector. However, using 20-pin power cable may cause the system to become unbootable or

unstable because of insufficient electricity. A minimum power of 300W is recommended for a fully-configured system.



With ATX v1.x power supply, users please note that when installing 20-pin power cable, the latch of power cable falls on the left side of the ATX1 connector latch, just as the picture shows.

With ATX v2.x power supply, users please note that when installing 24-pin power cable, the latches of power cable and the ATX1 match perfectly.

**MoniMax 5600****5.Control Electronics****CPU\_FAN1: FAN Power Connector**

Pin	Signal Name	Function
1	G ND	System Ground
2	+12V	Power +12V
3	Sense	Sensor
4	Control	CPU FAN control

**SYS\_FAN1: System Cooling FAN Power Connector**

Pin	Signal Name	Function
1	GND	System Ground
2	+12V	Power +12V
3	Sense	Sensor

**ATX1: ATX 24-pin Power Connector**

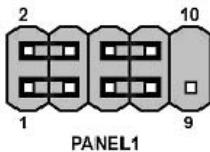
Pin	Signal Name	Pin	Signal Name
1		13	System Ground
2	+3.3V	14	-12V
3	Ground	15	Ground
4	+5V	16	PS_ON
5	Ground	17	Ground
6	+5V	18	Ground
7	Ground	19	Ground
8	PWRGD	20	-5V
9	+5VSB	21	+5V
10	+12V	22	+5V
11	+12V	23	+5V
12	+3.3V	24	Ground

**ATX12V1: ATX 12V Power Connector**

Pin	Signal Name
1	Ground
2	Ground
3	+12V
4	+12V

## Front Panel Header

The front panel header (PANEL1) provides a standard set of switch and LED headers commonly found on ATX or Micro ATX cases. Refer to the table below for information:



Pin	Signal	Function	Pin	Signal	Function
1	HD_LED_P	Hard disk LED(+)	2	FP PWR/SLP	*MSG LED(+)
3	HD_LED_N	Hard disk LED(-)	4	FP PWR/SLP	*MSG LED(-)
5	RST_SW_N	Reset Switch(-)	6	PWR_SW_P	Power Switch(+)
7	RST_SW_P	Reset Switch(+)	8	PWR_SW_N	Power Switch(-)
9	RSVD	Reserved	10	Key	No pin

## Hard Drive Activity LED

Connecting pins 1 and 3 to a front panel mounted LED provides visual indication that data is being read from or written to the hard drive. For the LED to function properly, an IDE drive should be connected to the onboard IDE interface. The LED will also show activity for devices connected to the SCSI (hard drive activity LED) connector.

## Power/Sleep/Message waiting LED

Connecting pins 2 and 4 to a single or dual-color, front panel mounted LED provides power on/off, sleep, and message waiting indication.

## Reset Switch

Supporting the reset function requires connecting pin 5 and 7 to a momentary-contact switch that is normally open. When the switch is closed, the board resets and runs POST.

## Power Switch

Supporting the power on/off function requires connecting pins 6 and 8 to a momentary-contact switch that is normally open. The switch should maintain contact for at least 50 ms to signal the power supply to switch on or off. The time requirement is due to internal de-bounce circuitry. After receiving a power on/off signal, at least two seconds elapses before the power supply recognizes another on/off signal.

#### 5.4.1.4 Installing the Processor

The following illustration shows CPU installation components.

A. Read and follow the instructions shown on the sticker on the CPU cap.

B. Unload the cap

- Use thumb & forefinger to hold the lifting tab of the cap.
- Lift the cap up and remove the cap completely from the socket.



C. Open the load plate

- Use thumb & forefinger to hold the hook of the lever, pushing down and pulling aside unlock it.
- Lift up the lever.
- Use thumb to open the load plate. Be careful not to touch the contacts.



D. Install the CPU on the socket

- Orientate CPU package to the socket. Make sure you match triangle marker to pin 1 location.



E. Close the load plate

- Slightly push down the load plate onto the tongue side, and hook the lever.
- CPU is locked completely.



F. Apply thermal grease on top of the CPU.

G. Fasten the cooling fan supporting base onto the CPU socket on the motherboard.

H. Make sure the CPU fan is plugged to the CPU fan connector. Please refer to the CPU cooling fan user's manual for more detail installation procedure.



### **5.4.1.5 Installing Memory Module**

This motherboard accomodates two memory modules. It can support two 240-pin DDR2 800/667. The total memory capacity is 4 GB.

#### **DDR2 SDRAM memory module table**

Memory module	Memory Bus
<b>DDR2 667</b>	<b>333 MHz</b>
<b>DDR2 800</b>	<b>400 MHz</b>

You must install at least one module in any of the two slots. Each module can be installed with 2 GB of memory; total memory capacity is 4 GB.

#### **Installation Procedure**

Refer to the following to install the memory modules.

1. This motherboard supports unbuffered DDR2 SDRAM .
2. Push the latches on each side of the DIMM slot down.
3. Align the memory module with the slot. The DIMM slots are keyed with notches and the DIMMs are keyed with cutouts so that they can only be installed correctly.
4. Check that the cutouts on the DIMM module edge connector match the notches in the DIMM slot.
- 5 . Install the DIMM module into the slot and press it firmly down until it seats correctly. The slot latches are levered upwards and latch on to the edges of the DIMM.
6. Install any remaining DIMM modules.



#### 5.4.1.6 Installing a Hard Disk Drive/CDROM / IDE Drive

This section describes how to install IDE devices such as a hard disk drive and a CDROM drive.

##### **IDE1: Primary IDE Connector**

The first hard drive should always be connected to IDE1.



IDE devices enclose jumpers or switches used to set the IDE device as MASTER or SLAVE. Refer to the IDE device user's manual. Installing two IDE devices on one cable, ensure that one device is set to MASTER and the other device is set to SLAVE. The documentation of your IDE device explains how to do this.

##### **Installing Serial ATA Hard Drives**

To install the Serial ATA (SATA) hard drives, use the SATA cable that supports the Serial ATA protocol. This SATA cable comes with an SATA power cable. You can connect either end of the SATA cable to the SATA hard drive or the connector on the motherboard.



##### **SATA cable (optional) SATA power cable (optional)**

Refer to the illustration below for proper installation:

- 1 Attach either cable end to the connector on the motherboard.
- 2 Attach the other cable end to the SATA hard drive.
- 3 Attach the SATA power cable to the SATA hard drive and connect the other end to the power supply.



**Installing a Floppy Diskette Drive**

The motherboard has a floppy diskette drive (FDD1) interface and ships with a diskette drive ribbon cable that supports one or two floppy diskette drives. You can install a 5.25-inch drive and a 3.5-inch drive with various capacities. The floppy diskette drive cable has one type of connector for a 5.25-inch drive and another type of connector for a 3.5-inch drive.

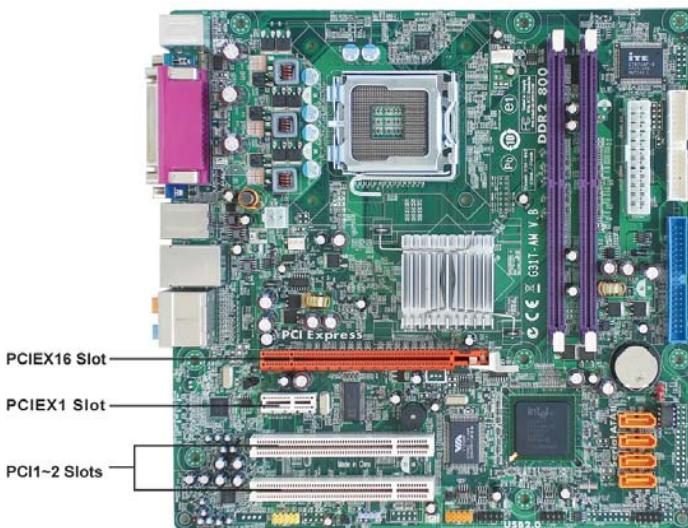
**FDD1: Floppy Disk Connector**

This connector supports the provided floppy drive ribbon cable. After connecting the single end to the onboard floppy connector, connect the remaining plugs on the other end to the floppy drives correspondingly.



#### 5.4.1.7 Installing Add-on Cards

The slots on this motherboard are designed to hold expansion cards and connect them to the system bus. Expansion slots are a means of adding or enhancing the motherboard's features and capabilities. With these efficient facilities, you can increase the motherboard's capabilities by adding hardware that performs tasks that are not part of the basic system.



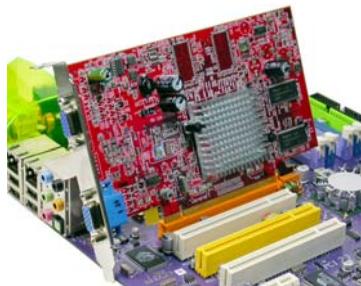
**PCIEX16 Slot** The PCI Express x16 slot is used to install an external PCI Express graphics card that is fully compliant to the PCI Express Base Specification revision 1.1.

**PCIEX1 Slot** The PCI Express x1 slots are fully compliant to the PCI Express Base Specification revision 1.0a.

**PCI1~2 Slots** This motherboard is equipped with two standard PCI slot. PCI stands for Peripheral Component Interconnect and is a bus standard for expansion cards, which for the most part, is a supplement of the older ISA bus standard. The PCI slots on this board are PCI v2.3 compliant.

Follow these instructions to install an add-on card:

1. Remove a blanking plate from the system case corresponding to the slot you are going to use.
2. Install the edge connector of the add-on card into the expansion slot. Ensure that the edge connector is correctly seated in the slot.
3. Secure the metal bracket of the card to the system case with a screw.

**MoniMax 5600****5. Control Electronics**

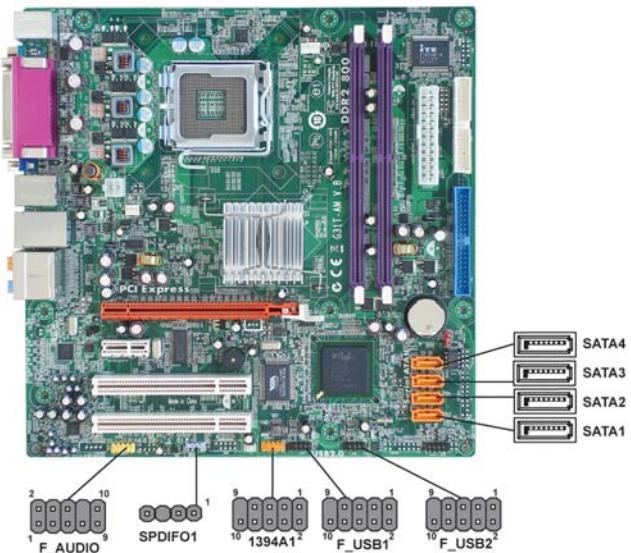
PCIEX16



PCI Card

***Connecting Optional Devices***

Refer to the following for information on connecting the motherboard's optional devices:

**F\_AUDIO: Front Panel Audio header for Azalia**

This header allows the user to install auxiliary front-oriented microphone and line-out ports for easier access.

Pin	Signal Name	Pin	Signal Name
1	PORT 1L	2	AUD_GND
3	PORT 1R	4	PRESENCE#
5	PORT 2R	6	SENSE1_RETURN
7	SENSE_SEND	8	KEY
9	PORT 2L	10	SENSE2_RETURN

**SATA1~4: Serial ATA connectors**

These connectors are used to support the new Serial ATA devices for the highest data transfer rates (3.0 Gb/s), simpler disk drive cabling and easier PC assembly. It eliminates limitations of the current Parallel ATA interface. But maintains register compatibility and software compatibility with Parallel ATA.

Pin	Signal Name	Pin	Signal Name
1	Ground	2	TX+
3	TX	4	Ground
5	RX	6	RX+
7	Ground	-	

**1394A1: IEEE 1394A header (Optional)**

Connect this header to any device with IEEE 1394a interface.

Pin	Signal Name	Pin	Signal Name
1	TPA+	2	TPA
3	GND	4	GND
5	TPB+	6	TPB
7	Cable-Power	8	Cable-Power
9	Key Pin	10	GND

**F\_USB1~2: Front Panel USB headers**

The motherboard has four USB ports installed on the rear edge I/O port array. Additionally, some computer cases have USB ports at the front of the case. If you have this kind of case, use auxiliary USB connector to connect the front-mounted ports to the motherboard.

Pin	Signal Name	Function
1	USBPWR	Front Panel USB Power
2	USBPWR	Front Panel USB Power
3	USB_FP_P0	USB Port 0 Negative Signal
4	USB_FP_P1	USB Port 1 Negative Signal
5	USB_FP_P0+	USB Port 0 Positive Signal
6	USB_FP_P1+	USB Port 1 Positive Signal
7	GND	Ground

**MoniMax 5600****5. Control Electronics**

8	GND	Ground
9	Key	No pin
10	USB_FP_OC0	Overcurrent signal

*Please make sure that the USB cable has the same pin assignment as indicated above. A different pin assignment may cause damage or system hang-up.*

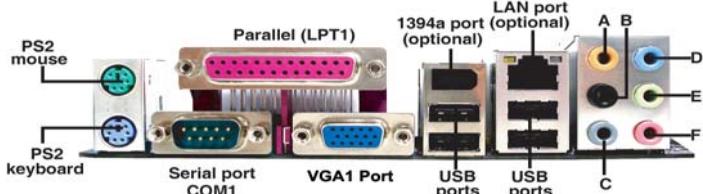
**SPDIFO1: SPDIF out header**

This is an optional header that provides an S/PDIF (Sony/Philips Digital Interface) output to digital multimedia device through optical fiber or coaxial connector.

Pin	Signal Name	Function
1	SPDIF	SPDIF digital output
2	+5VA	5V analog Power
3	Key	No pin
4	GND	Ground

**Connecting I/O Devices**

The backplane of the motherboard has the following I/O ports:



**PS2 Mouse** Use the upper PS/2 port to connect a PS/2 pointing device.

**PS2 Keyboard** Use the lower PS/2 port to connect a PS/2 keyboard.

**Parallel Port (LPT1)** Use LPT1 to connect printers or other parallel communications devices.

**Serial Port (COM1)** Use the COM1 port to connect serial devices such as mice or fax/modems.

**VGA1 Port** Connect your monitor to the VGA1 port.

**LAN Port (optional)** Connect an RJ-45 jack to the LAN port to connect your computer to the Network.

**1394A Port (optional)** Use the 1394A port to connect 1394 devices.

## MoniMax 5600

## 5.Control Electronics

**USB Ports** Use the USB ports to connect USB devices.

**Audio Ports** Use the audio jacks to connect audio devices. The D port is for stereo line-in signal, while the F port is for microphone in signal. This motherboard supports 8-channel audio de vices that correspond to the A, B, C, and E port respectively. In addition, all of the 3 ports, B, C, and E provide users with both right & left channels individually.  
Users refer to the following note for specific port function definition.

### 5.4.1.8 BIOS Setting

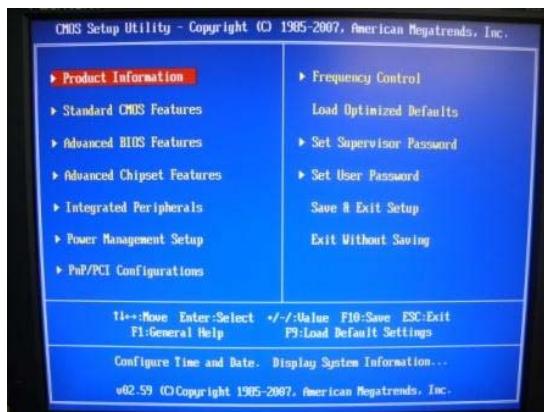
The computer uses the latest “American Megatrends Inc.” BIOS with support for Windows Plug and Play. The CMOS chip on the motherboard contains the ROM setup instructions for configuring the motherboard BIOS.

#### Entering the Setup Utility

When you power on the system, BIOS enters the Power-On Self Test (POST) routines. POST is a series of built-in diagnostics performed by the BIOS. After the POST routines are completed, the following message appears:

- 1) Press DEL to enter SETUP

Press the delete key to access the BIOS Setup Utility.



BIOS Main Menu

- 2) Press F9 to load Default Settings. [OK]
- 3) Press F10 to Save and Exit. [OK]



F9 Load Default Settings



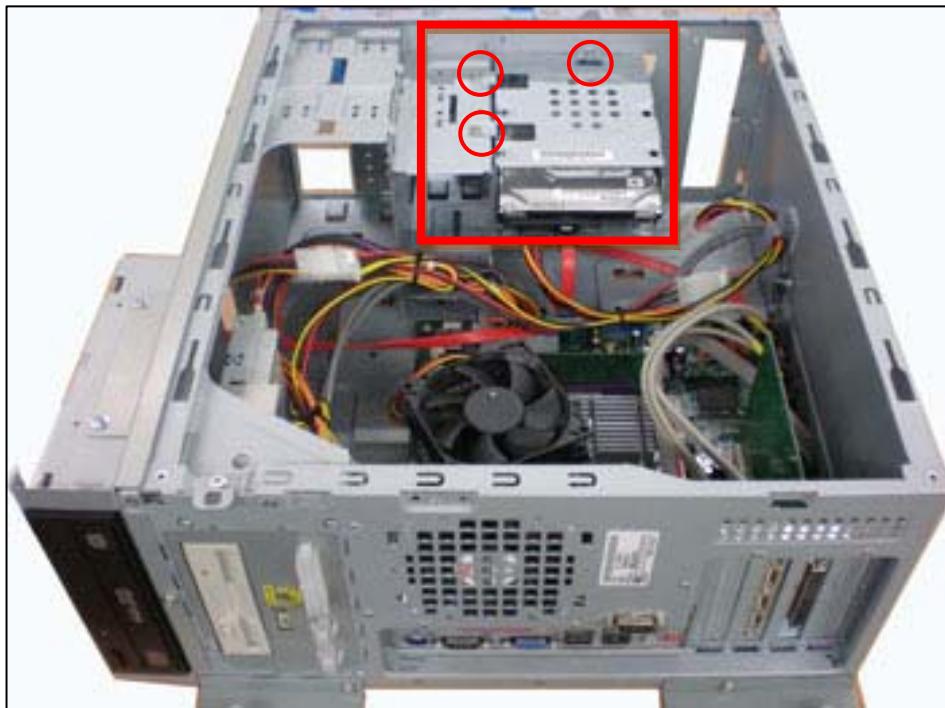
F10 Save and Exit

**MoniMax 5600****5. Control Electronics****5.4.2 HDD**

It is a storage device of CE module within ATM System (generic auxiliary storage device) to take installation CD to allow for OS(Windows XP) and AP program installation.



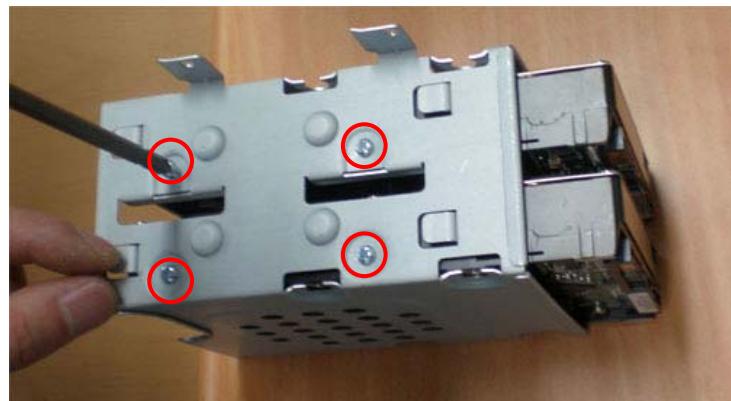
HDD Sample Picture



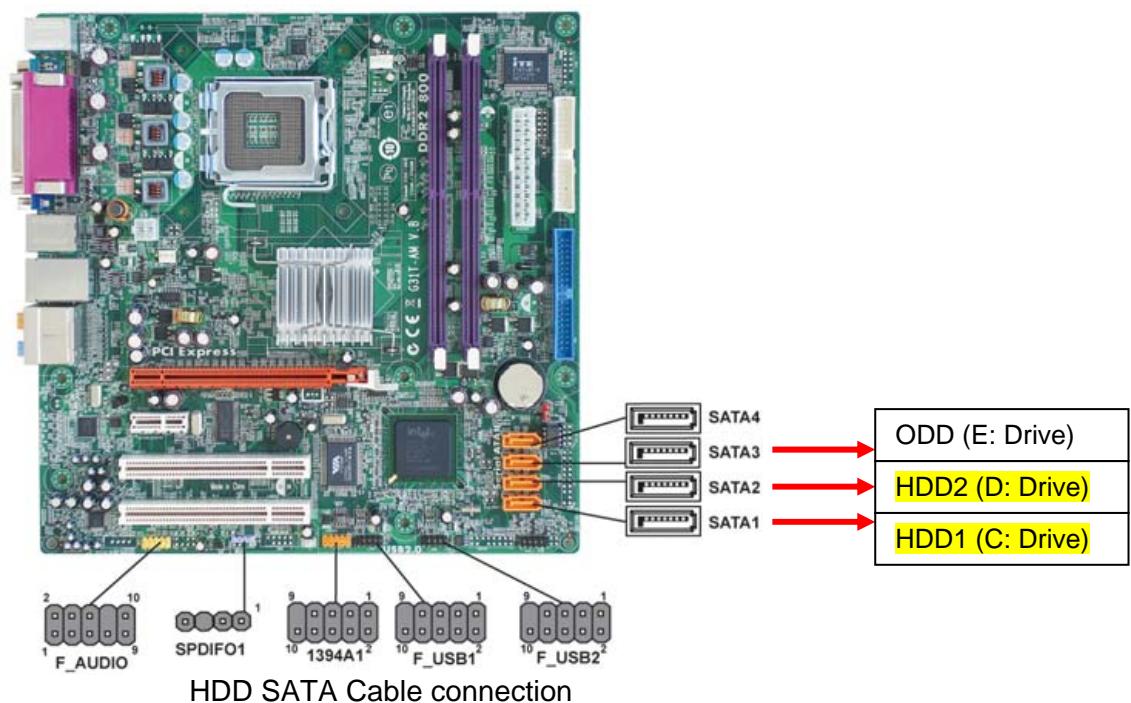
HDD Location and Screwable point

MoniMax 5600

5. Control Electronics



Screwable Point of HDD

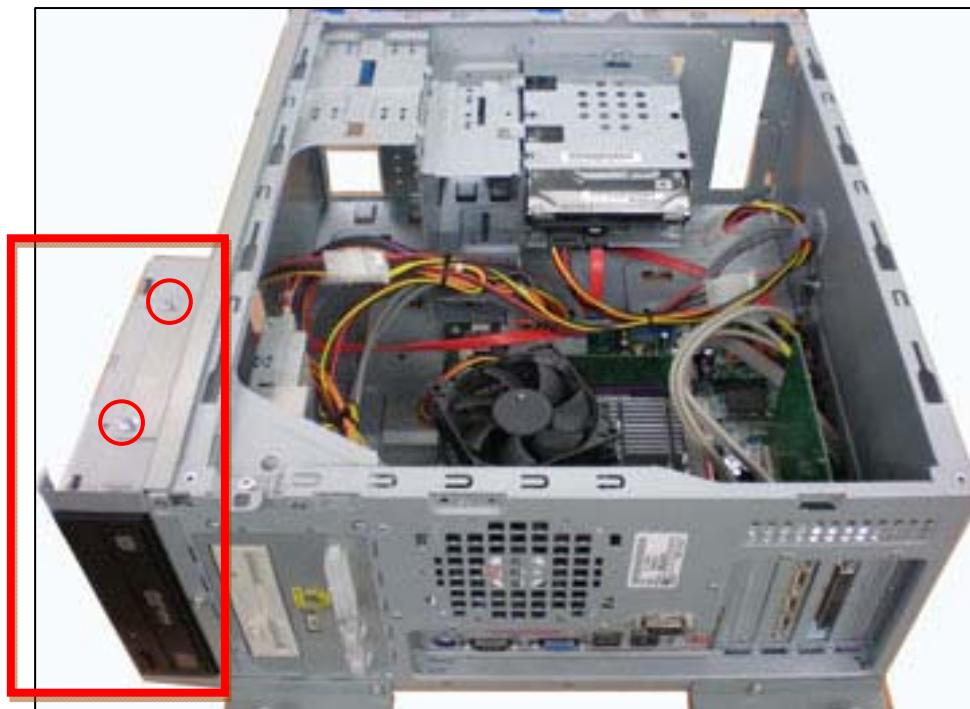


### 5.4.3 ODD

It is a storage device of CE module within ATM System (generic auxiliary storage device) to take installation CD to allow for OS(Windows XP) and AP program installation.



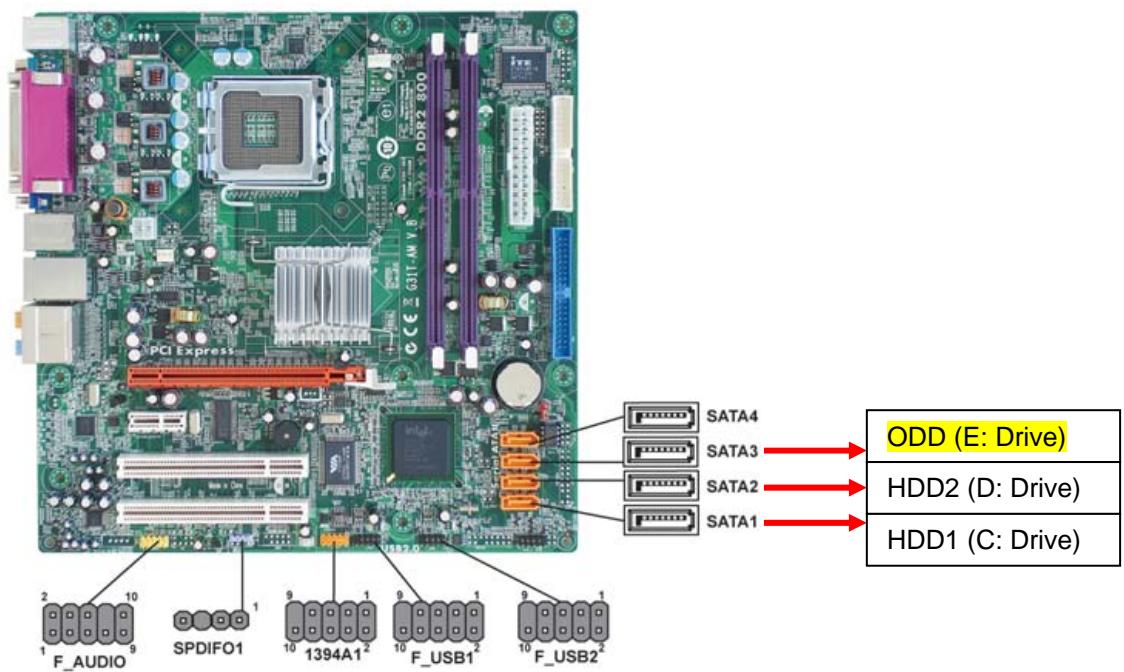
ODD( CDROM / DVD ROM ) Sample Picture



ODD Location and Screwable point

MoniMax 5600

5. Control Electronics



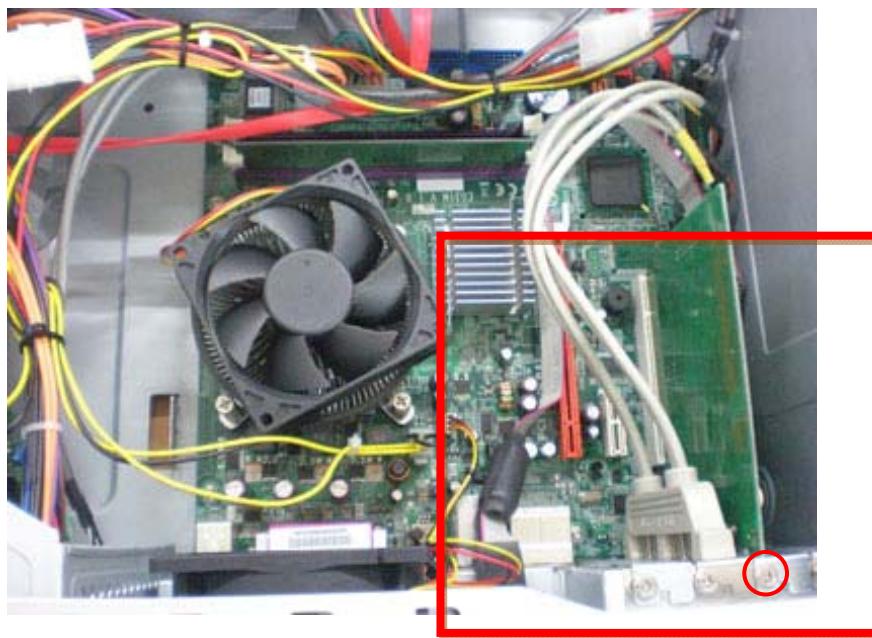
ODD SATA Cable connection

#### 5.4.4 PCI Serial Card

It is a 4Port Serial Communication device of CE module within ATM System to communicate with Units(CDU, MCU, EDU etc).



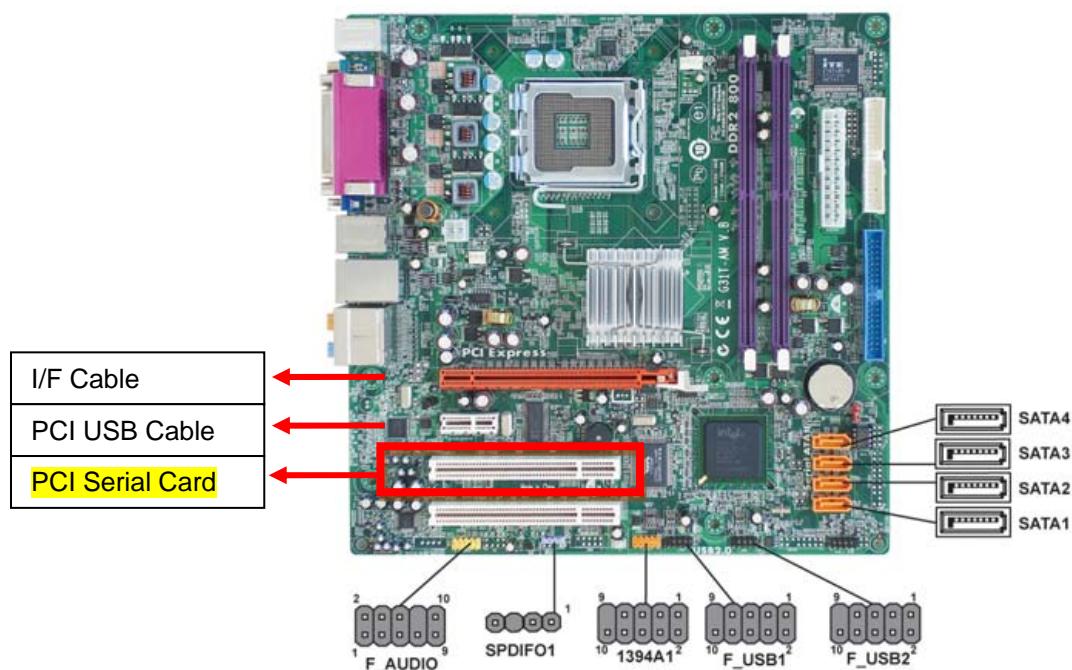
4 Port PCI Serial Card



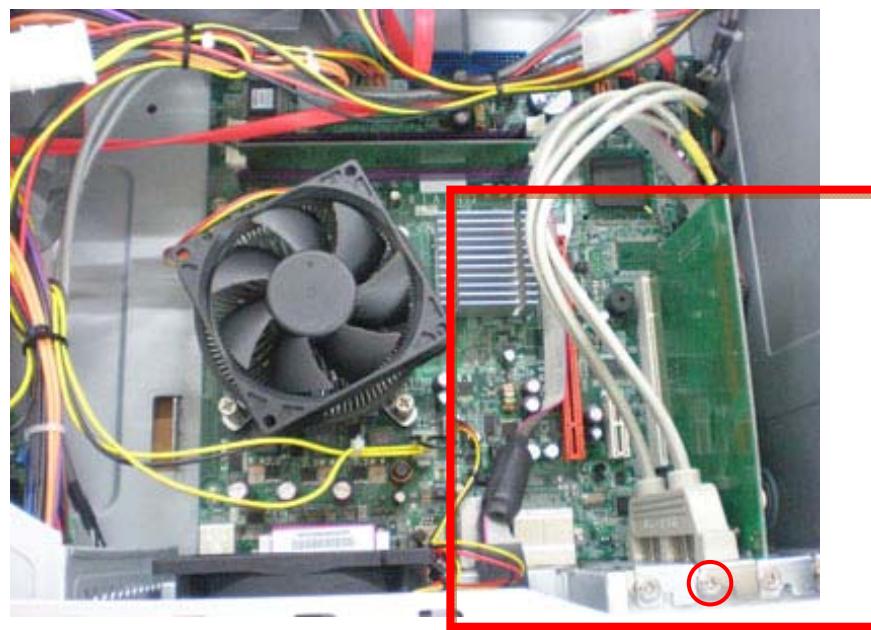
4 PORT PCI Serial Card Location and Screwable point

## MoniMax 5600

## 5. Control Electronics



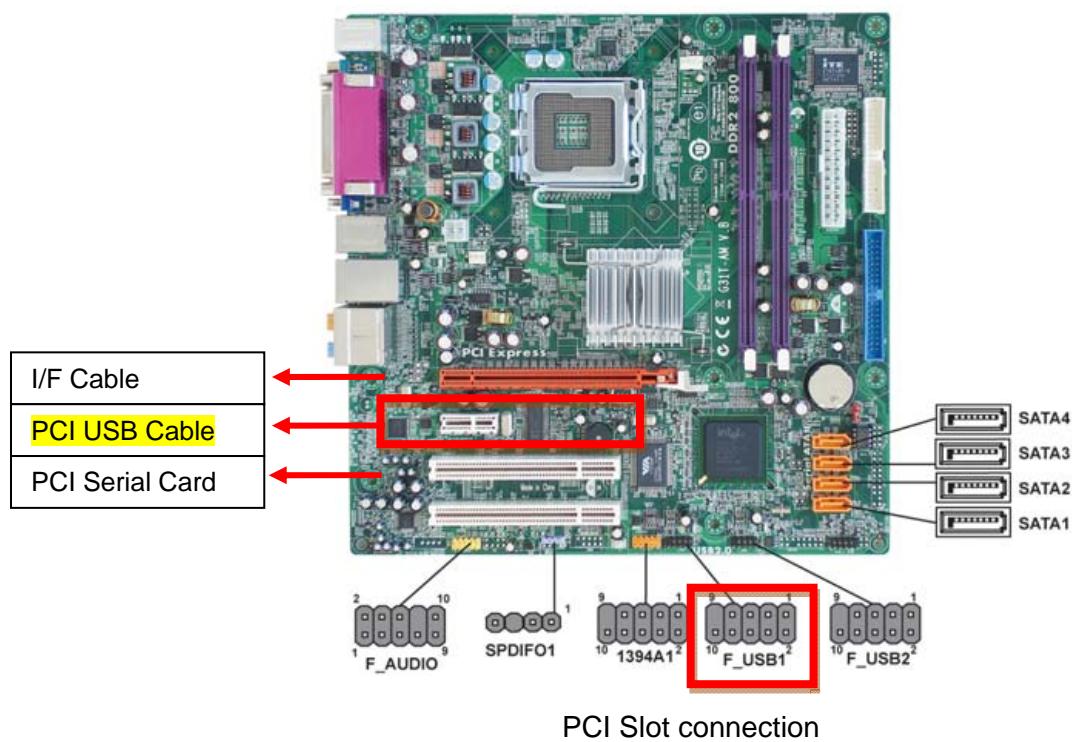
### 5.4.5 PCI USB Cable



PCI USB Location and Screwable point

MoniMax 5600

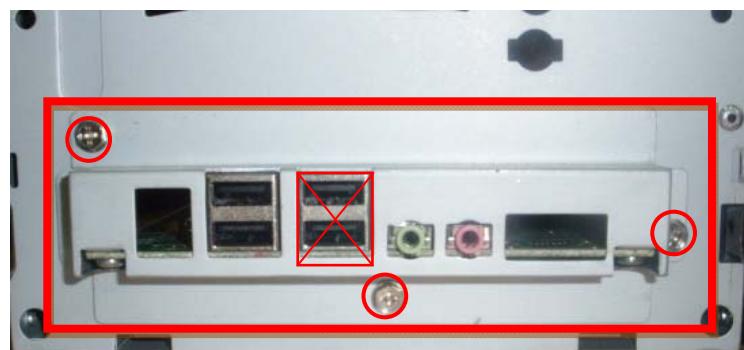
5. Control Electronics



#### 5.4.6 Front I/O Board (USB Slot)



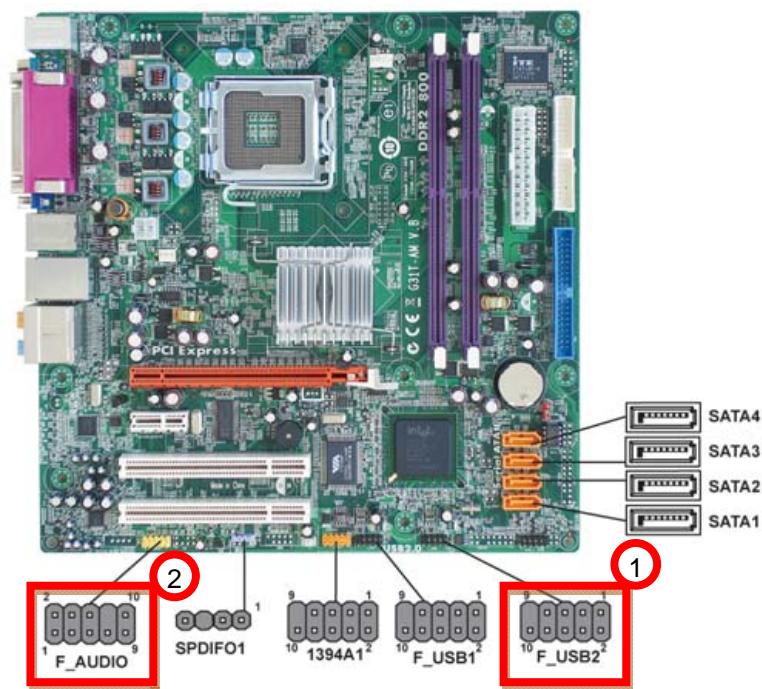
Front I/O Board



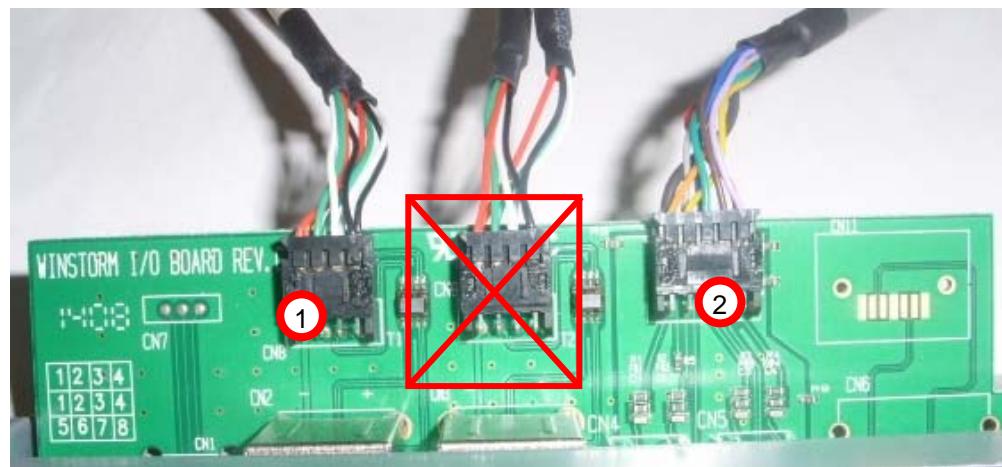
Front I/O Board Location and Screwable point

## MoniMax 5600

## 5. Control Electronics



Cable connection



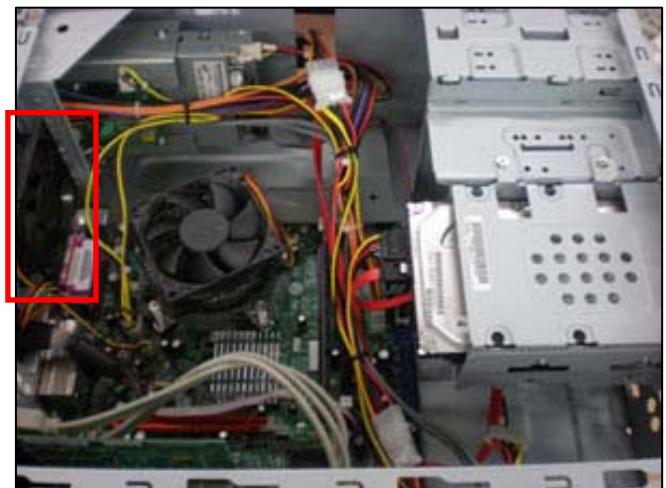
MoniMax 5600

5.Control Electronics

**5.4.7 SYS FAN**



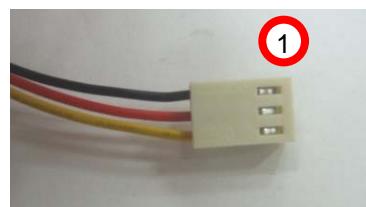
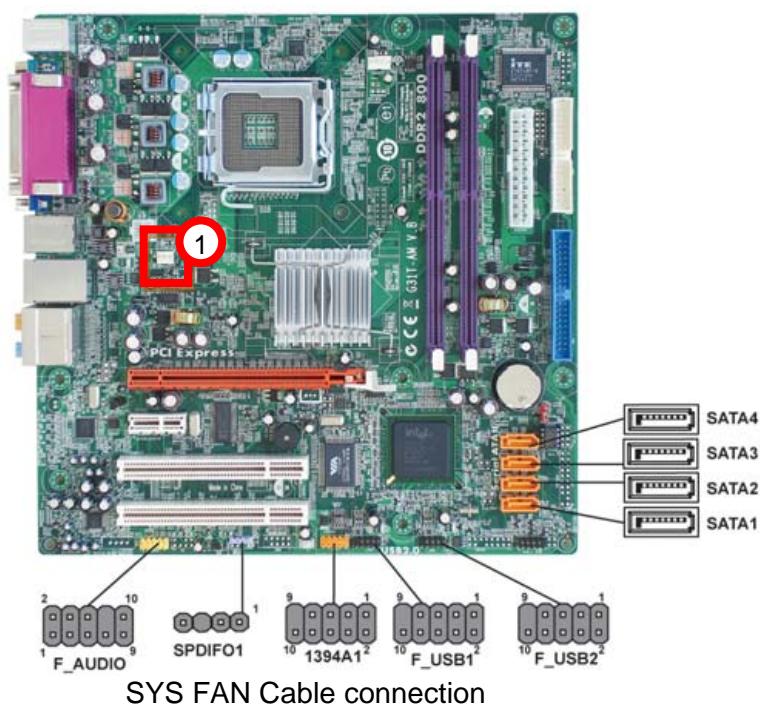
SYSTEM FAN



SYS FAN Location and Screwable point

MoniMax 5600

5. Control Electronics

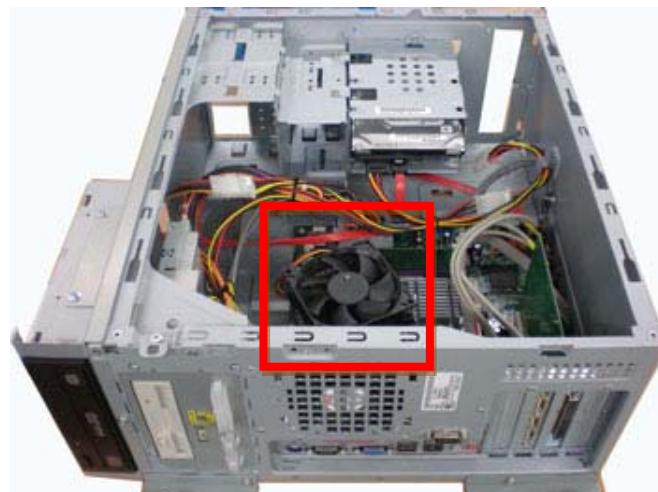
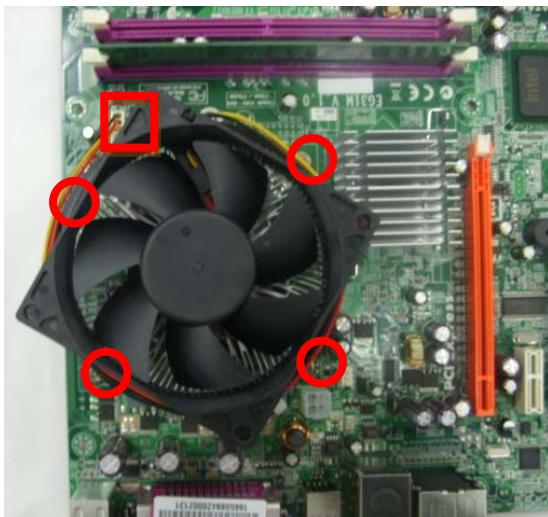


FAN Power Connector

### 5.4.8 CPU Cooler



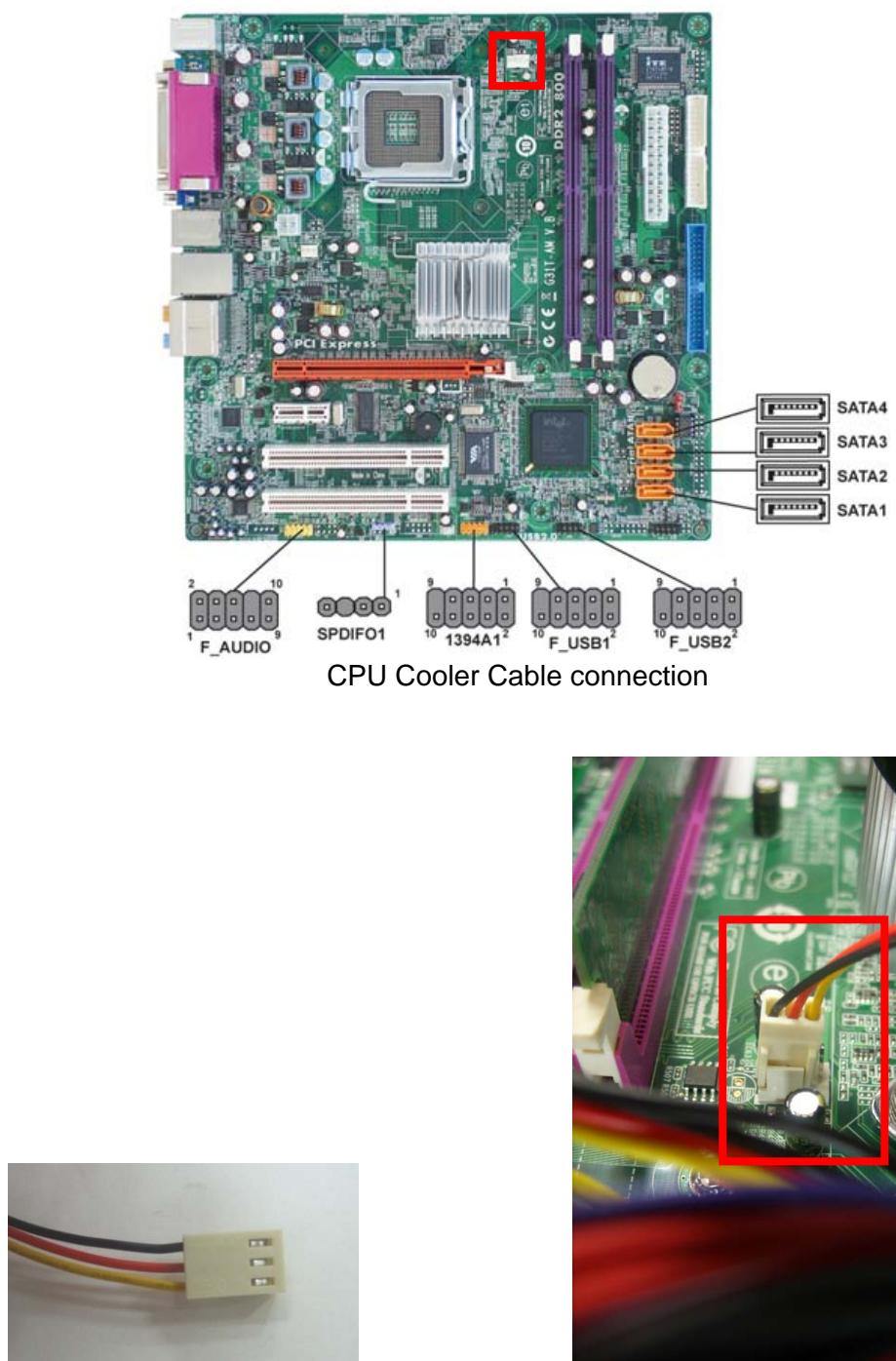
CPU Cooler



CPU Cooler Location and Screwable point

MoniMax 5600

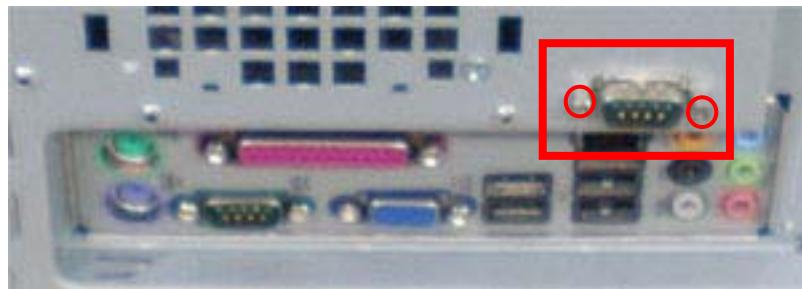
5. Control Electronics



### 5.4.9 Serial Cable(COM2)



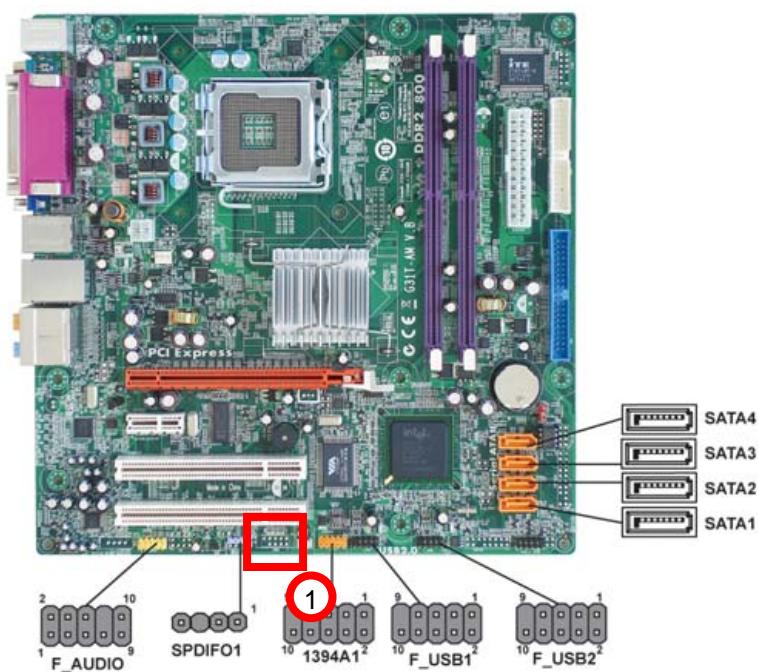
Serial Cable



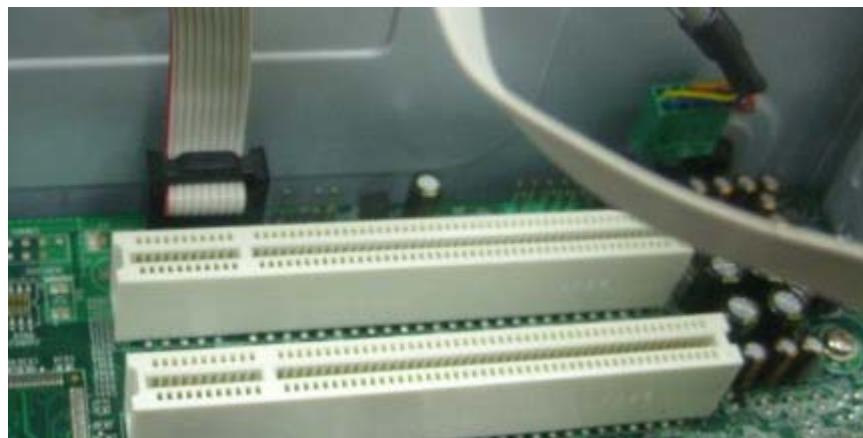
Serial Cable(COM2) Location and Screwable point

MoniMax 5600

5. Control Electronics

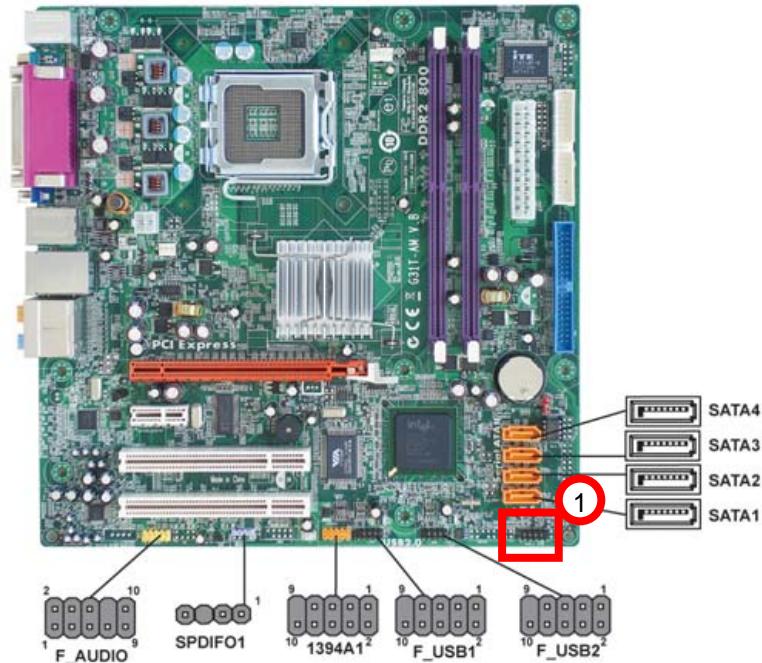


Serial Cable connection

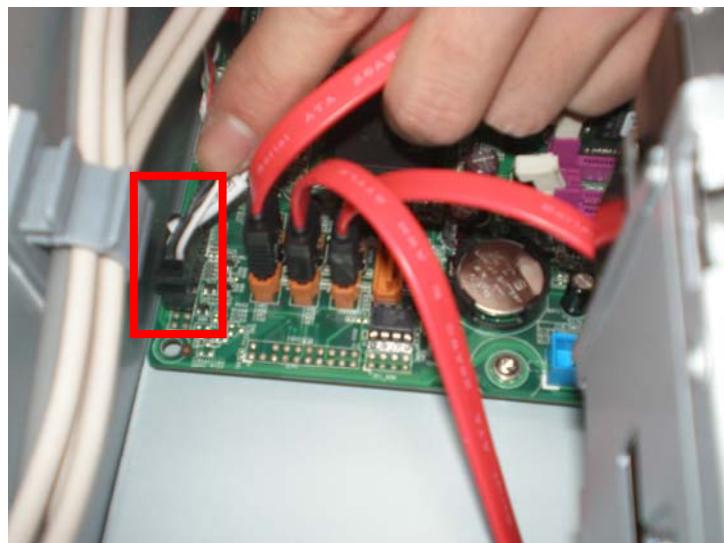


### 5.4.10 Main Board Button I/F Cable

Mainboard Power Button and Reset Button can be controlled by PNC Unit through the Button I/F Cable.



Main board Button I/F Cable connection



MoniMax 5600

**6. Cash Dispensing Unit**

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## **Chapter 6. Cash Dispensing Unit (CDU)**

## **6.1. Overview**

This Cash Dispensing Unit (CDU) is located on the right side of the safe door and can be divided into 5 major modules as follows.

- Body Module
- Presenter Assembly
- Four Feed Modules
- Four Cash Cassettes
- Reject & Retract Box

Body Module is composed of two lever type Double Bill Detection mechanism and a high precision sensor, which measures the thickness of the transmitted bills and verifies if it is one or more than two bills. It presents only “normal” bills to customers by filtering all of the “bad” bills through Gate Solenoid operation.

Presenter Assembly is a mechanism that provides customers with bills stacked in the Body Module and the assembly direction changes whether it is Front Access type or Rear Access type.

Feed Module transfers the bills mounted inside the cash cassette to cash dispenser, and measures the number of dispensed bills, quantity of skew, size of bills, and space between bills. Also, the Clutch Assembly that supplies power to Main Motor is contained in the Feed Module which enables dispensing bills from a certain cash cassette with just one motor.

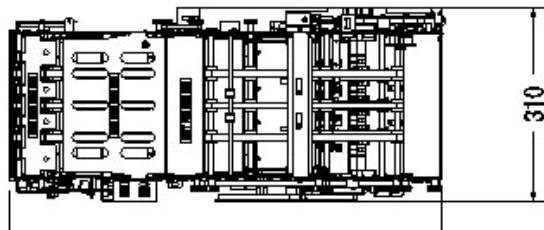
The cash cassette has the Bill Pick-up Module made of light plastic, which is user-friendly and can be easily replaced in the branch.

Reject & Retract Box is an integral system that transfers defective bills from cash cassette to Reject Department while sending the bills withdrawn but not taken by customers to the Retract Department where the bills can be safely stored.

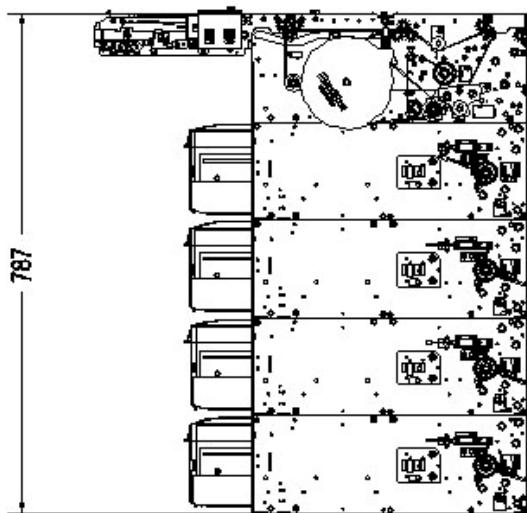
**MoniMax 5600****6. Cash Dispensing Unit****6.1.1 Appearance and Dimension**

The following figures show the three sectional diagrams of the cash dispenser.

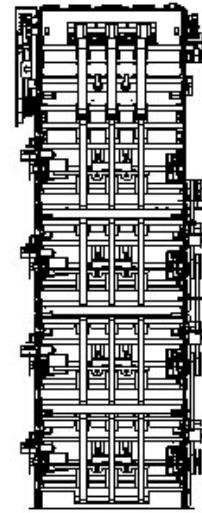
Its dimension is 680mm high, 310 mm wide and 787mm long.



Plane View



Side View (Right)



Front View

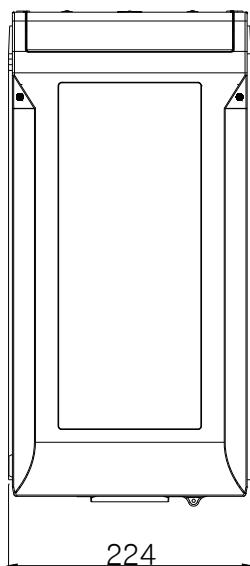
Fig. 6.1 Cash dispenser Appearance and Dimension

**MoniMax 5600****6. Cash Dispensing Unit**

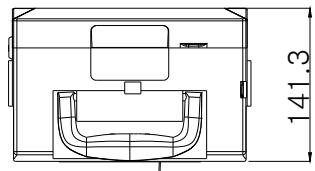
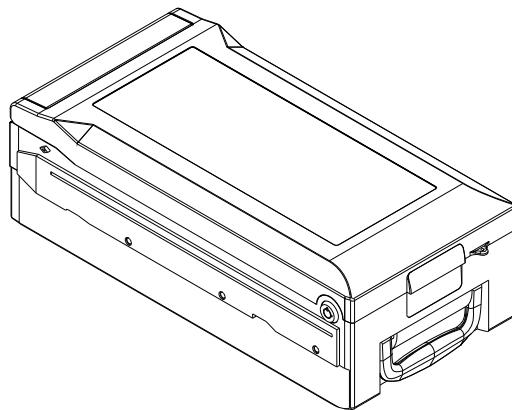
The following figures show three sectional diagrams of the cash cassette. Cash cassette is 141.3mm high, 224mm wide and 447mm long.

**[WARNING!]**

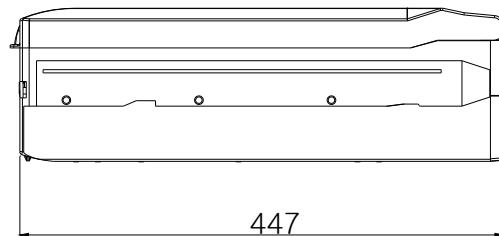
**Because the Pick-up Module in the cash cassette is made of plastic, which is fragile and vulnerable to any shock, be careful not to drop or damage the cash cassette while handling or transferring the module.**



Plane View



Front View



Side View (Right)

Fig. 6.2 Cassette Appearance and Dimension

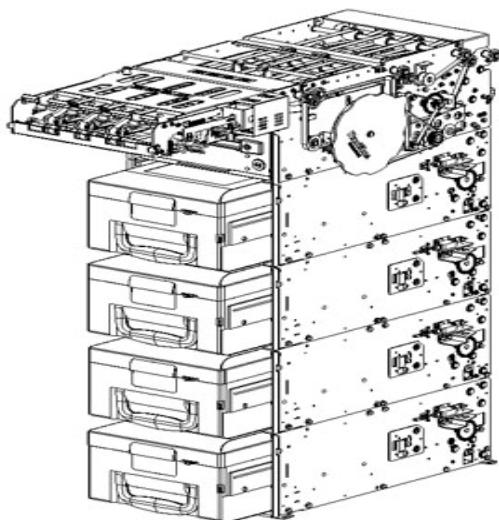
### 6.1.2 Basic Specifications

The following table shows the basic specifications of Cash Dispenser.

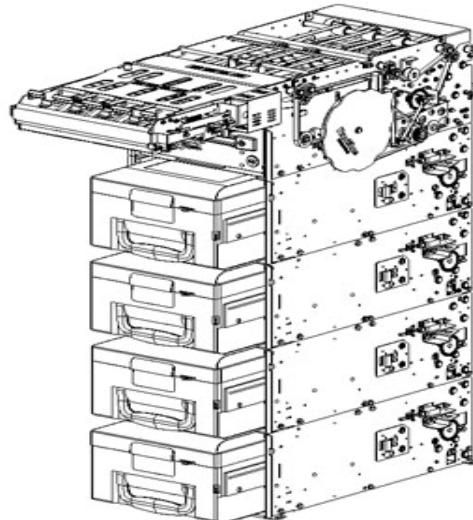
NO.	ITEM	SPECIFICATION	NOTES
1	Bills handled	- Note Length : 125~167mm Width : 65~ 78mm	Multi-bill cassette (82mm is optional width.)
2	Maximum number of bills dispensed	50 bills/transaction	
3	Number of cassettes	4 EA (3,000 bills)	
4	Cash Dispensing Method	- Stack Present	
5	Reject /Retract box	- Note by Note Reject - Reject capacity : Max storage amount 250 notes - Retract capacity : up to 150 notes	
6	Double bill detection	- Lever detection amplification Method	2 Lever type
7	Cassette Structure	- Polycarbonate Plastic Case	
8	Cassette Loading Method	- Front Loading - Loading without mounting /demounting unit	
9	Separated reject	- Over-lap separation - Reject: Solenoid Control - Separation: Electronic clutch	
10	Used key	- Cassette Key - Reject and Retract Box Key	
11	Detection Function	- Detection of cassette identification - Detection of available notes - Detection of multiple notes - Note length and interval detection - Cassette position detection - Detection of bill empty in cassette	

**MoniMax 5600****6. Cash Dispensing Unit****6.1.3 Various type of cash dispenser**

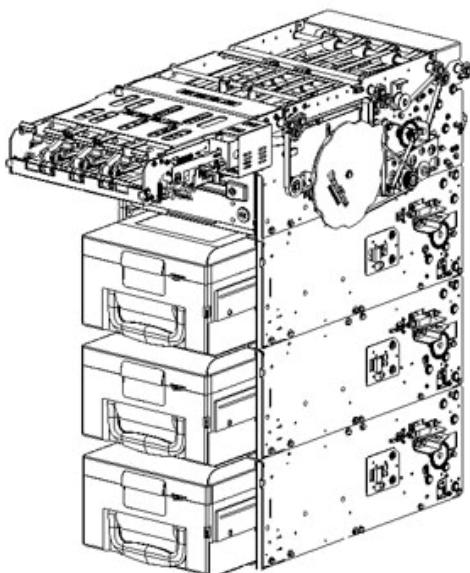
The standard type in this cash dispenser is the front access cash dispenser with four cassettes and no shutter on the body. However, this cash dispenser can be supported with a lot of optional types as the direction of presenter, the availability of shutter and the number of cassette will be changed, as shown the below pictures.



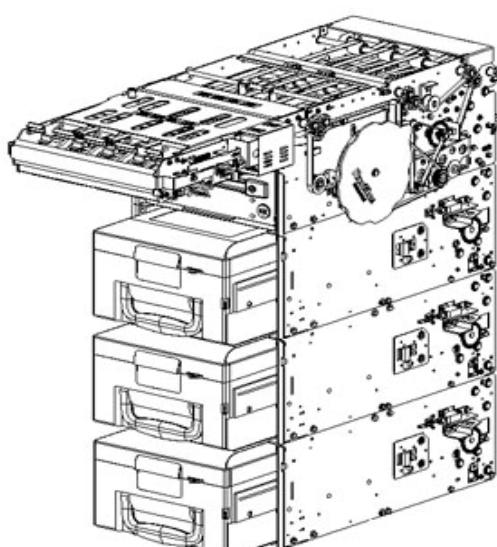
**Standard type**  
(Front access, No shutter, 4 cassettes)



**Optional type 1**  
(Front access, with Shutter, 4 cassettes)



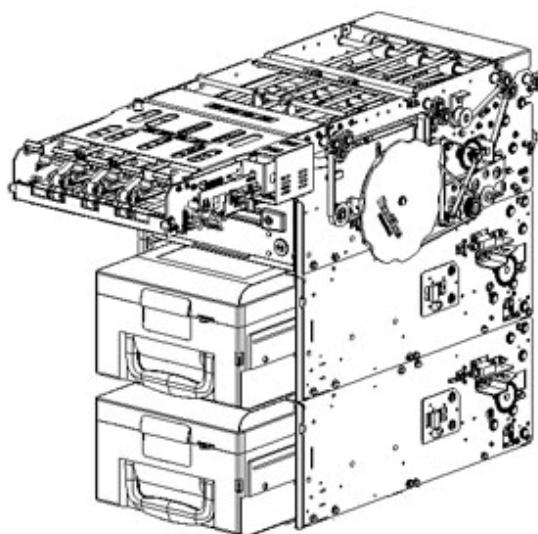
**Optional type 2**  
(Front access, No shutter, 3 cassettes)



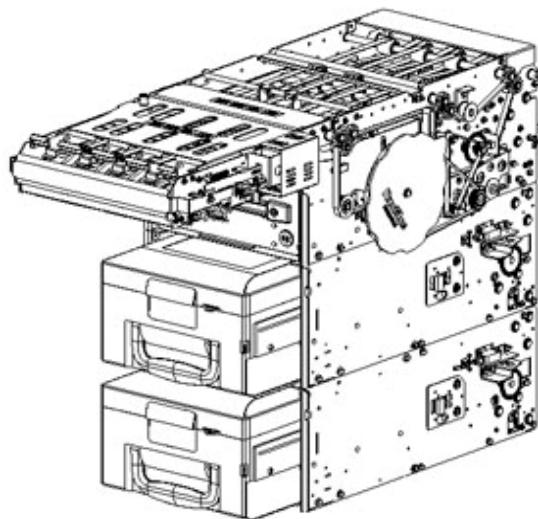
**Optional type 3**  
(Front access, with Shutter, 3 cassettes)

**MoniMax 5600**

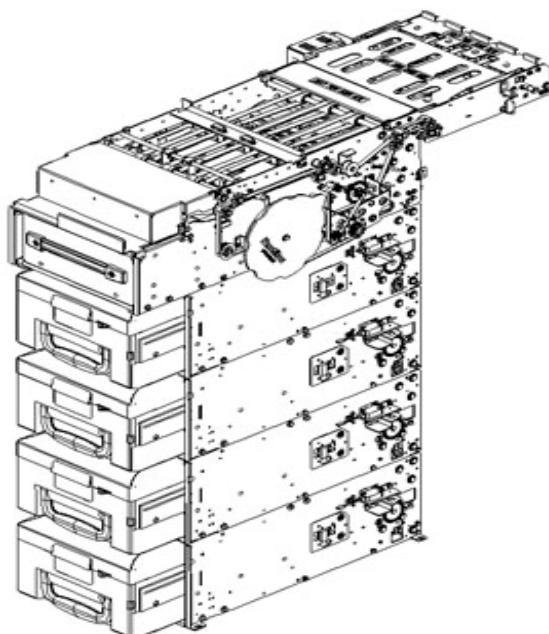
**6. Cash Dispensing Unit**



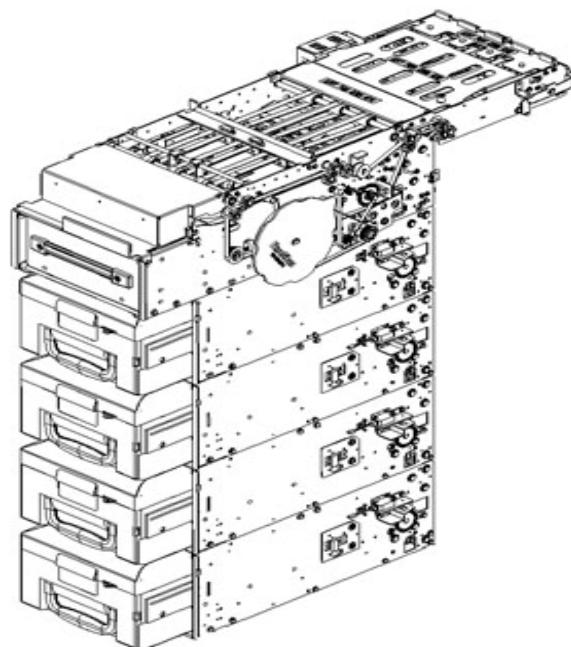
Optional type 4  
(Front access, No shutter, 2 cassettes)



Optional type 5  
(Front access, with Shutter, 2 cassettes)



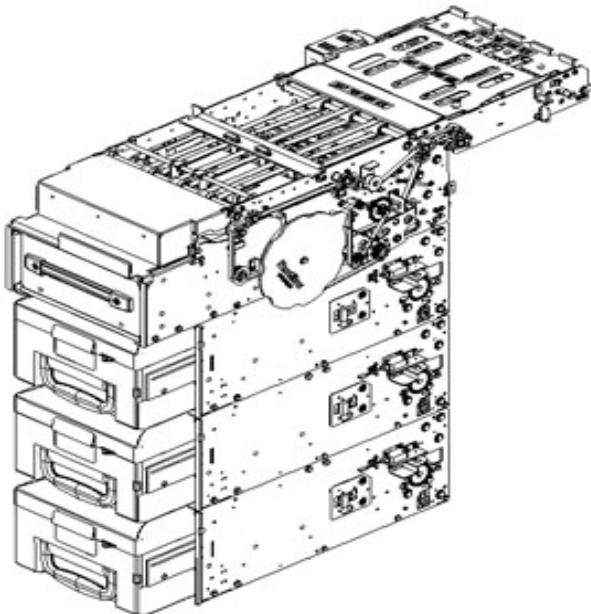
Optional type 6  
(Rear access, No shutter, 4 cassettes)



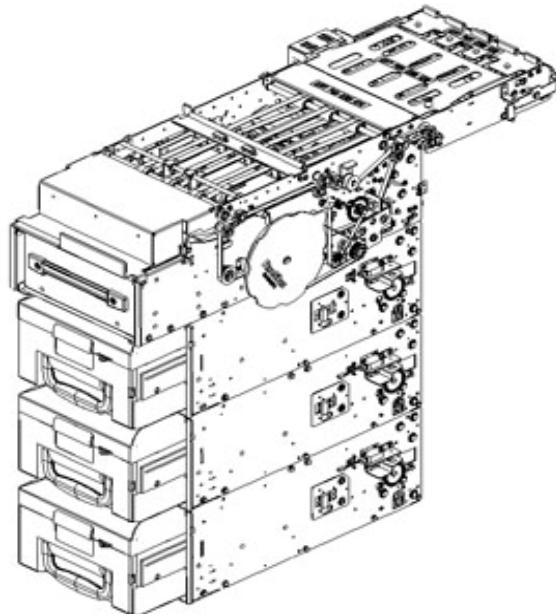
Optional type 7  
(Rear access, with Shutter, 4 cassettes)

MoniMax 5600

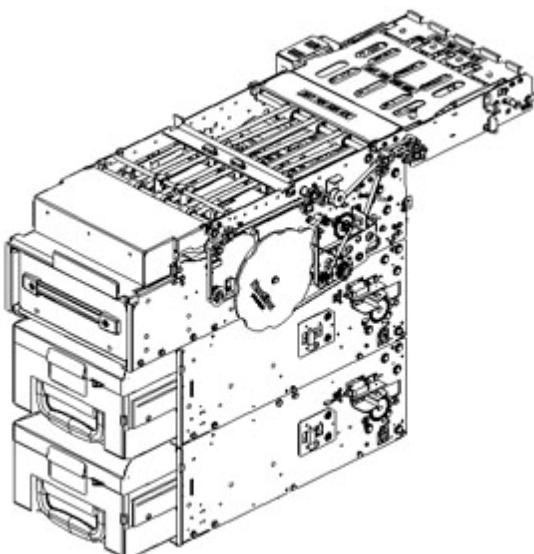
6. Cash Dispensing Unit



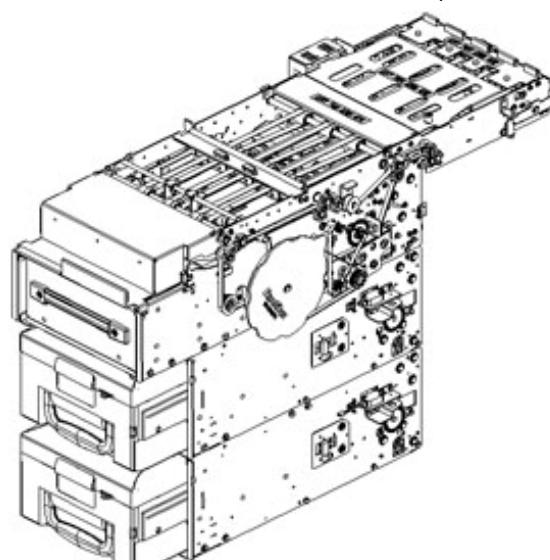
Optional type 8  
(Rear access, No shutter, 3 cassettes)



Optional type 9  
(Rear access, with Shutter, 3 cassettes)



Optional type 10  
(Rear access, No shutter, 2 cassettes)



Optional type 11  
(Rear access, with Shutter, 2 cassettes)

Fig. 6.3 Optional type of cash dispenser

### **6.1.4 Functional Description**

#### **6.1.4.1 Actuator Diagram**

Electromagnetic components used for the cash dispenser are three motors, four micro-clutches, and two solenoids. The functions and roles of each component are as follows.

##### **1) Main Motor**

Main Motor is a major power source for transferring bills picked up in the cash cassette to the temporary stacker through the transport path. Power is supplied through the micro-clutch located in each feed module.

##### **2) Cam Motor**

Cam Motor is used for transferring the notes stacked in the temporary stacker to the upper transport path or moving the temporary stacker.

##### **3) Delivery Motor**

Delivery Motor carries the bills transferred to the upper transport path to the Presenter Assembly, making them ready for being delivered to the final customer.

##### **4) Micro-clutch**

In order to dispense bills from a certain cash cassette, power should be supplied from the Main Motor to the cash cassette. That is, for the release of the bills only from that cash cassette, the micro clutch of the Feed Model in that cassette should work while micro clutches in the other feed modules don't.

##### **5) Gate Solenoid**

The bills picked up in the cash cassette are detected by number of sensors and separated into good and bad notes. Good notes are released to customers while bad notes are transferred to the Reject Box. It is Gate Solenoid which does the separation job, and since it should distinguish the notes simultaneously in the short span of the time, the disassembly and assembly of the Gate Solenoid requires an adjustment point.

##### **6) Exit Shutter Solenoid**

To convey normal bills to customers, the Exit Shutter should be opened or closed. The Shutter is designed to require the lock mechanism to prevent customers from opening the Shutter at their own discretion.

Electro-magnetic components used for this cash dispenser is illustrated in Fig.6.4

## MoniMax 5600

## 6. Cash Dispensing Unit

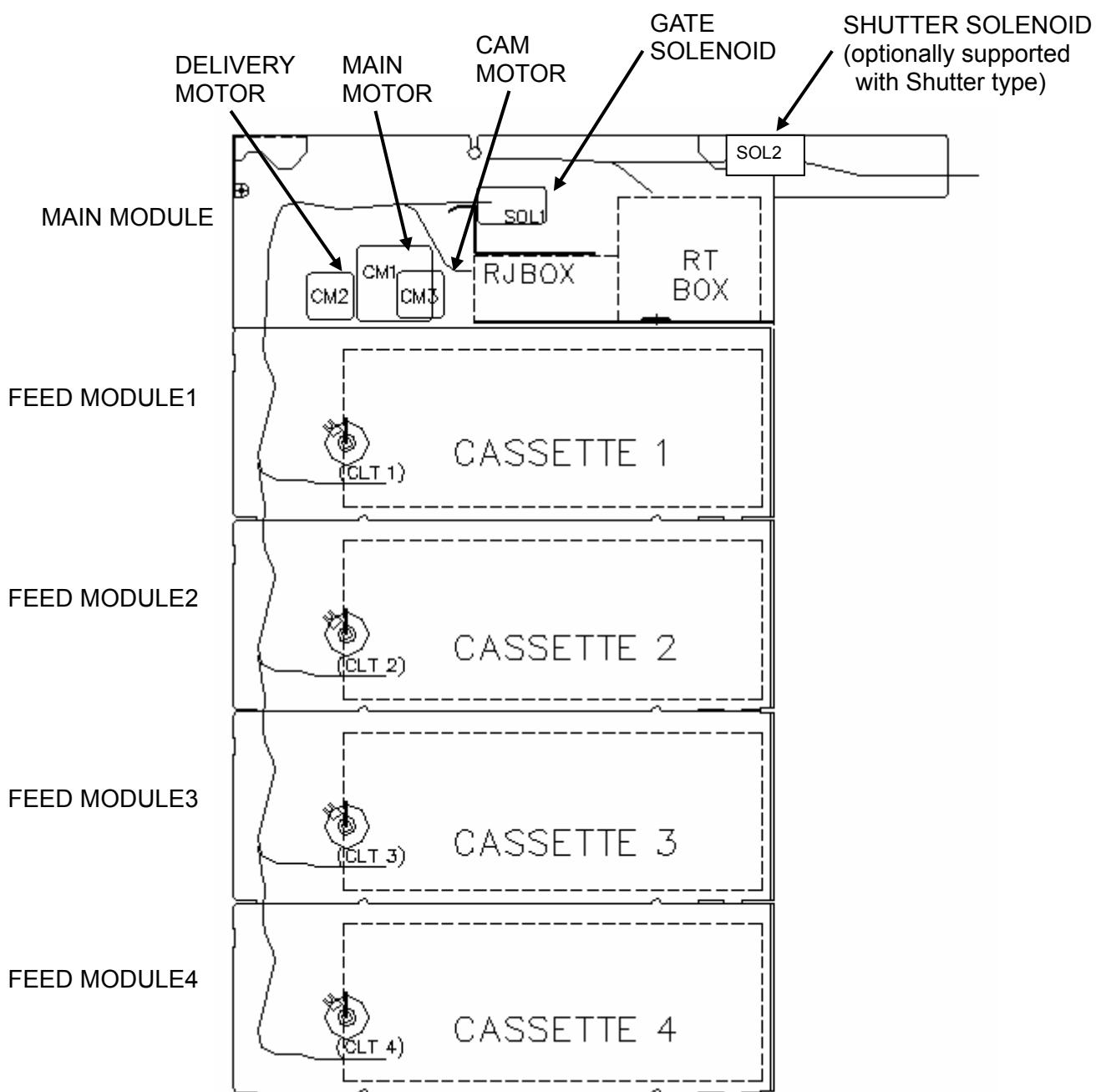


Fig. 6.4 Actuator Diagram

**6.1.4.2 Sensor Diagram**

Inside the cash dispenser, various types of sensors having different functions and roles are embedded. While some of the sensors look identical, their roles are still different, which requires a careful attention.

Photo Transmitted Sensor (Separating type)

Photo Transmitted Sensor (Coupling type)

Photo Reflecting Sensor

Micro Switch

Magnetic Sensor

Normally, sensor consists of two kinds of components

Sending a signal : LED (Light Emitting Diode)

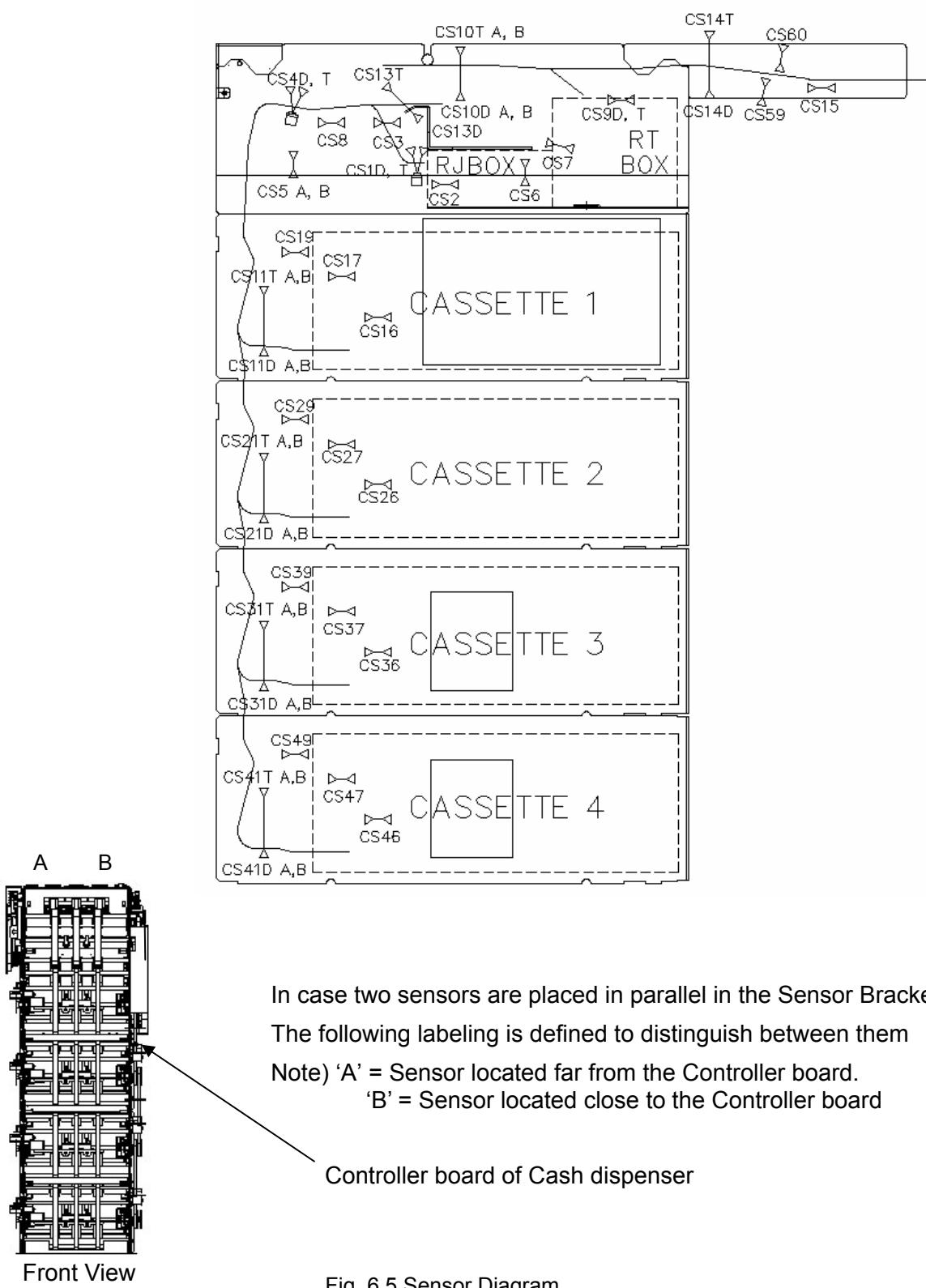
Receiving a signal : Tr (Transistor)

The separating type transmitted sensor in the Transport path has LED (Labeling:"D") at the bottom and Tr (Labeling:"T") at the top to minimize the impact of external solar light and dust. It is important not to change the assembly direction of LED and Tr during the disassembly or replacement process. Also, two sensors are placed in parallel in one Sensor Bracket. In order to distinguish between the two sensors, the one closer to the Controller board will be called "A," while the rear one called "B."

Sensors used for this cash dispenser is illustrated in Fig.6.5

## MoniMax 5600

## 6. Cash Dispensing Unit



**MoniMax 5600****6. Cash Dispensing Unit**

The name and functions of each Sensor can be summarized as below.

<b>NO</b>	<b>SYMBOL</b>	<b>NAME</b>	<b>DESCRIPTION</b>
1	CS 17,27,37,47	Cassette Docking Sensor	
2	CS 12,22,32,42	Cassette ID Sensor	
3	CS 16,26,36,46	Cash Low Sensor	
4	CS 18,28,38,48	Bill Empty Detection Sensor	
5	CS 11,21,31,41	Cassette Outlet Jam Detection Sensor	
6	CS 19,29,39,49	Clutch Encoder Sensor	
7	CS 5	Double Note Detection Sensor	
8	CS 4	Gate Operating Criteria Sensor	
9	CS 3	Gate Operation Sensor	
10	CS 8	Main Motor Encoder Sensor	
11	CS 13	Bill Counting Sensor	
12	CS1	Reject Box Jam Detection Sensor	
13	CS 2	Reject Box Docking Sensor	
14	CS 3	Gate Operation Sensor	
15	CS 6, 7	Cam Detection Sensor	
16	CS 9	Retract Box Full Sensor	
17	CS 10	Stacker Bill Detection Sensor	
18	CS 14	Upper Transport Jam Sensor	
19	S1,	Shutter Open Sensor	
20	S2	Shutter Close Sensor	
21	CS 15	Bill Withdrawal Detection Sensor	

#### 6.1.4.3 The Judgment Criteria for Sensor

The type of sensors varies depending on the purpose and function, with different scope and judgment criteria that show high and low status. As shown in the following table, there are criteria that determine high and low status of each sensor, which means that field technicians can know whether a sensor works properly or not if they have a voltmeter.

LABELING	JUDGMENT CRITERIA				SENSOR TYPE
	HIGH	LOW	DEFAULT	SPECIFICATION	
CS1	> 6 V	< 6V	12V	Blocking : Low Unblocking : High	G-310, ST-310 (Permeating type)
CS2	> 6V	< 6V	12V	Normal : Low Abnormal: High	Micro s/w UP-331A-4D
CS3	> 6V	< 6V	12V	Blocking : High Unblocking : Low	KLG-248
CS4	-	-	-	Auto-dimming sensor mode	G-310, ST-310 (Permeating type)
CS5A,CS5B CS55A,CS55B	>4V	<1V	0V	Blocking : High Unblocking : Low	KLG-248
CS6	> 6 V	< 6V	12V	Blocking : High Unblocking : Low	KLG-248
CS7	> 6 V	< 6V	12V	Blocking : High Unblocking : Low	KLG-248
CS8	>4V	<1V	0V	Blocking : High Unblocking : Low	KLG-248
CS9	> 6.8V	< 6.8V	12V	Blocking : Low Unblocking : High	G-310, ST-310 (Permeating type)
CS10A,10B	-	-	-	Auto-dimming sensor mode	G-310, ST-310 (Permeating type)
CS11A~41A CS11B~41B	> 6.8V	< 6.8V	12V	Blocking : Low Unblocking : High	G-310, ST-310 (Permeating type)
CS12A~CS42A CS12B~CS42B CS12C~CS42C CS12D~CS42D	>4V	<1V	0V	On : Low Off : High	REED S/W

**MoniMax 5600****6. Cash Dispensing Unit**

LABELING	JUDGMENT CRITERIA				SENSOR TYPE
	HIGH	LOW	DEFAULT	SPECIFICATION	
CS13A	-	-	-	Auto-dimming sensor mode	G-310, ST-310 (Permeating type)
CS14	-	-		Auto-dimming sensor mode	G-310, ST-310 (Permeating type)
CS15	> 6 V	< 6V	12V	Blocking : High Unblocking : Low	KLG-248
CS16,CS26 CS36,CS46	>1.05V	<1.05V	-	Cash Enough : High Cash Low : Low	SG-113
CS17,CS27 CS37,CS47	> 6V	< 6V	12V	Normal : Low Abnormal: High	Micro s/w UP-331A-4D
CS18,CS28 CS38,CS48	> 6V	< 6V	12V	Blocking : Low Unblocking : High	G-310, ST-310 (Permeating type)
CS19,CS29 CS39,CS49	> 6V	< 6V	12V	Blocking : Low Unblocking : High	G-310, ST-310 (Permeating type)

## 6.2 Device Channel Description

Cash dispenser conducts USB communication with the CE engine, and supplies power to each electromagnetic component after converting +24V received from Power Supply to +5V,+12V, and +24V. In order to check the communication status with the CE engine, see if TxD RxD LED blinks in the Control Board of cash dispenser. To check the power status, see if the Power LED is on.

### 6.2.1 Communication Interface Specifications

USB (Universal Serial Bus) Interface is used for communication with a built-in CPU that supports up to 12MBps. (USB1.1)

### 6.2.2 Power Interface Specifications

Power supply for the Control Board is +24V single output, while the voltage of Sensor and OP-Amp is +12V and that of CPU is +3.3V. The power supply for TTL type components is +5V. Refer to Chapter 3.5 for the Cabling diagram between CE engine and cash dispenser, and Chapter 6.2.3.4 CN9 connector for specifications of Cash dispenser controller board.

Power status can be visually inspected by checking the Power LED in the Controller Board. However, more accurate information can be acquired through a voltmeter which measure the DC of the connector to see if the power supply is within the range of 24V±5% tolerance.

### 6.2.3 Controller Board Specification

The CPU is S3C2410(ARM9) with internal clock at 200Mhz. The USB Controller built in the CPU is used to communicate with the Host through USB 1.1. SDRAM is K4S281632(16Mbyte), while Flash Memory AM29LV160DB(2Mbyte) is used for storing the program. Also, AT24C02(256Byte) EEPROM is used for storing machine's significant information like bill denomination, setting information and Serial Port for Debugging. LM339 (Comparater) and Auto Dimming Circuit determine the sensor judgment, while PWM Motor Driver is used for controlling DC Motor. Also, LED and Segment are used to display the Board status.

### 6.2.3.1 Block Diagram of Controller board

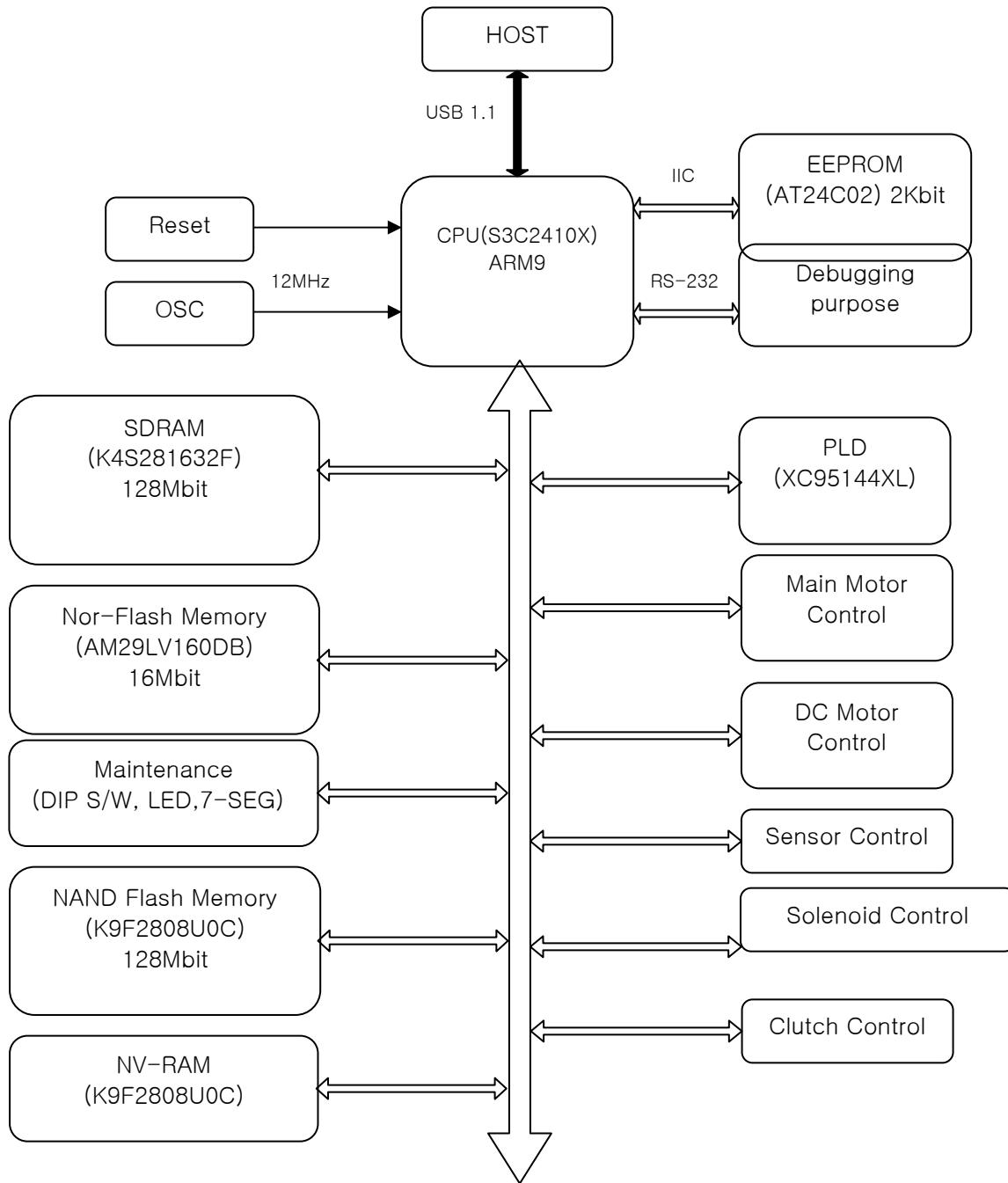


Fig. 6.6 Block diagram of Controller board

**MoniMax 5600****6. Cash Dispensing Unit****6.2.3.2 Exterior I/O port of CPU**

NO	I/O NAME	ADDRESS	DESCRIPTION	REMARK
1	SEG	nGCS2 + 00H	7-Segment Display	Write
2	SEN_SEL	nGCS2 + 04H	1st~ 4th Cassette Sensor Information	Read
3	SEN1_SEL	nGCS2 + 08H	5th Cassette Sensor Information (Reserved)	Read
4	SLIT0_DATA	nGCS2 + 10H	1st Lever Double Bill Detection Data	Read
5	SLIT1_DATA	nGCS2 + 14H	2nd Lever Double Bill Detection Data	Read
6	SLIT_DATA_CLR	nGCS2 + 18H	1st and 2nd Lever Double Bill Detection Data Clear	Write
7	PLD_REV	nGCS2 + 20H	PLD Revision.	Read

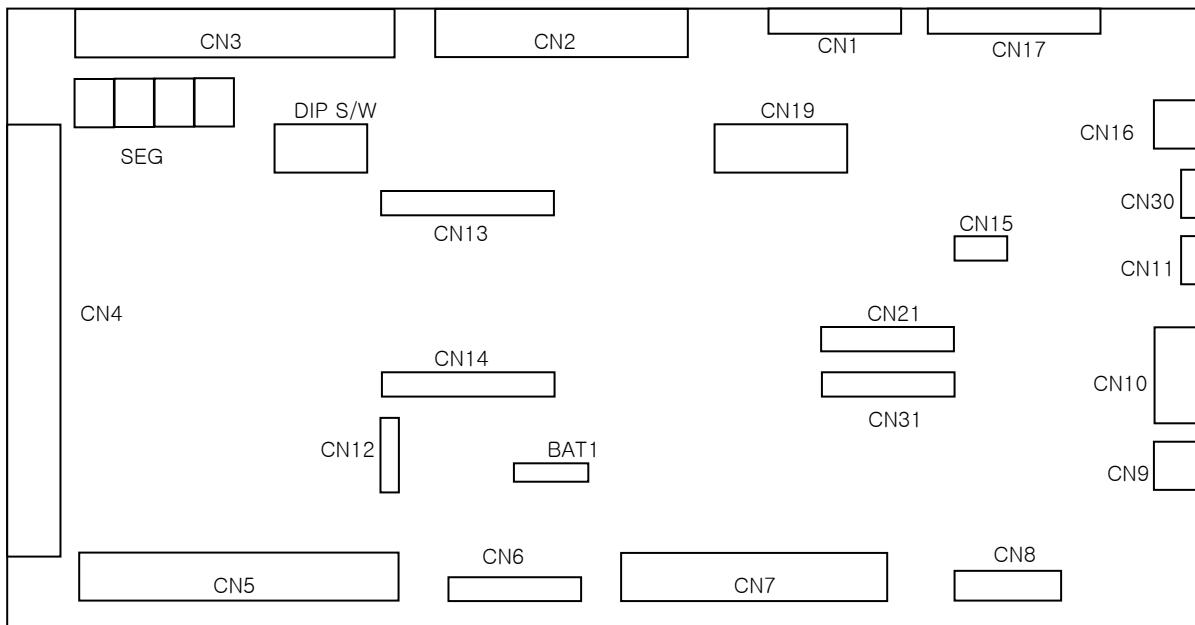
**6.2.3.3 External Interface Connector**

Fig. 6.7 External Interface Connector

LABELING	PART NO	PART NAME	DESCRIPTION
CN1	33313110	CONN:HDR:SR:STR:GIL-G-10P-S3T2-E:10P	The signal of Main Motor and Solenoid
CN2	33300120	CONN:HDR:LOCK:R/A:HIF3BA-20PA-2.54DS	1st Main Sensor Assembly
CN3	33300140	CONN:HDR:LOCK:R/A:HIF3BA-40PA-2.54DS	2nd Main Sensor Assembly

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LABELING	PART NO	PART NAME	DESCRIPTION
CN4	33300160	CONN:HDR:LOCK:R/A:RCR-60A-2.54D-L	1st and 2nd CASSETTE SENSOR
CN5	33300160	CONN:HDR:LOCK:R/A:RCR-60A-2.54D-L	3rd and 4th CASSETTE SENSOR
CN6	33313110	CONN:HDR:SR:STR:GIL-G-10P-S3T2-E:10P	CLUTCH 1,2,3,4
CN7	33300126	CONN:HDR:LOCK:R/A:HIF3BA-26PA-2.54DS	reserved
CN8	33316306	CONN:HDR:BOX:STR:6P:5267-06A:MOLEX	1,2,3,4 CASSETTE ID B/D GND
CN9	33311904	CONN:HDR:R/A:4P:5569-04AL	MAIN POWER(+24V, GND)
CN10	33402001	CONN:D-SUB:R/A:SOCKET:9P	reserved
CN11	33316302	CONN:HDR:BOX:STR:3P:5267-03A	reserved
CN12	33314001	CONN:HDR:SR:STR:36P:.230"/.095":0.12	PLD DOWNLOAD
CN13/CN14	33313601	CONN:HDR:DR:STR:72P:.230"/.095"(18PIN)	EP DOWNLOAD
CN15	33316302	CONN:HDR:BOX:STR:3P:5267-03A	reserved
CN16	33373601	CONN_USB(B_TYPE):787780-1:R/A:4POS:AMP	USB
CN17	33313112	CON:HDR:SR:STR:GIL-G-12P-S3T2-E:12P	Shutter Solenoid / Sensor
CN19	33303620	CONN:HDR:BOX:STR:DR:HIF3FB-20PA-2.54DSA	JTAG
CN21/CN31	33316310	CONN:HDR:BOX:STR:10P:5267-10A:MOLEX	POWER(+5V,+12V,+24V,GND)
CN30	3330000021	CONN:STR:70543-0001:2P	DOCK

**1) Main Motor and Solenoid (CN1)**

NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.
1	+24VI	4	CM4B	7	SOL1	10	SOL_VCC
2	MO_GND	5	CM3A	8	SOL_VCC		
3	CM4A	6	CM3B	9	SOL2		

**2) 1<sup>st</sup> Main Sensor Assembly (CN2)**

NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.
1	SVCC	6	GND	11	CS10B	16	+12V
2	GND	7	CS10A	12	+12V	17	VCC
3	CS13A	8	+12V	13	SVCC1	18	GND
4	+12V	9	SVCC	14	GND	19	CS15
5	SVCC	10	GND	15	CS14	20	

**MoniMax 5600****6. Cash Dispensing Unit****3) 2<sup>nd</sup> Main Sensor Assembly (CN3)**

NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.
1	NC	11	CS6	21	SVCC	31	CS5_A
2	+12V	12	GND	22	+12V	32	CS5_ECHO
3	CS2	13	+5V	23	CS9	33	CS55_B
4	+5V	14	GND	24	GND	34	GND
5	CS3	15	CS7	25	SVCC	35	CS55_A
6	GND	16	+5V	26	+12V	36	2MVCC
7	SVCC	17	+5V	27	CS1	37	CS55_ECHO
8	GND	18	GND	28	GND	38	
9	CS4	19	CS8	29	CS5_B	39	
10	+12V	20	GND	30	+5V	40	

**4) 1&2 Cassette Sensor (CN4)**

NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.
1	SVCC/+5V	16	GND	31	SVCC	46	GND
2	GND	17	CS17	32	GND	47	CS26
3	CS101	18	GND	33	CS21A	48	GND
4	GND	19	+5V	34	+12V	49	CS29
5	SVCC	20	GND	35	SVCC	50	+5V
6	GND	21	CS16	36	GND	51	+5V
7	CS11A	22	GND	37	CS21B	52	+5V
8	+12V	23	CS19	38	+12V	53	CS22A
9	SVCC	24	+5V	39	SVCC1	54	CS22B
10	GND	25	+5V	40	GND	55	CS22C
11	CS11B	26	+5V	41	CS28	56	CS22D
12	+12V	27	CS12A	42	GND	57	SVCC/+5V
13	SVCC1	28	CS12B	43	CS27	58	GND
14	GND	29	CS12C	44	GND	59	CS102
15	CS18	30	CS12D	45	+5V	60	GND

**MoniMax 5600****6. Cash Dispensing Unit****5) 3&4 Cassette Sensor (CN5)**

NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.
1	SVCC/+5V	16	GND	31	SVCC	46	GND
2	GND	17	CS37	32	GND	47	CS46
3	CS103	18	GND	33	CS41A	48	GND
4	GND	19	+5V	34	+12V	49	CS49
5	SVCC	20	GND	35	SVCC	50	+5V
6	GND	21	CS36	36	GND	51	+5V
7	CS31A	22	GND	37	CS41B	52	+5V
8	+12V	23	CS39	38	+12V	53	CS42A
9	SVCC	24	+5V	39	SVCC1	54	CS42B
10	GND	25	+5V	40	GND	55	CS42C
11	CS31B	26	+5V	41	CS48	56	CS42D
12	+12V	27	CS32A	42	GND	57	SVCC/+5V
13	SVCC1	28	CS32B	43	CS47	58	GND
14	GND	29	CS32C	44	GND	59	CS104
15	CS38	30	CS32D	45	+5V	60	GND

**6) Clutch (CN6)**

NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.
1	CLUTCH_VCC	4	CST_CL_2P	7	CLUTCH_VCC	10	CST_CL_5P
2	CLUTCH	5	CLUTCH_VCC	8	CST_CL_4P		
3	CLUTCH_VCC	6	CST_CL_3P	9	CLUTCH_VCC		

**7) Cassette ID board (CN8)**

NO.	CONFIG.	NO.	CONFIG.
1	+5VD	4	GND
2	+12VD	5	GND
3	GND	6	+24VD

**MoniMax 5600****6. Cash Dispensing Unit****8) Main Power (CN9)**

NO.	CONFIG.	NO.	CONFIG.
1	+24VID	3	GND
2	+24VID	4	GND

4	3
2	1

&lt;Front view&gt;

**9) USB (CN16)**

NO.	CONFIG.	NO.	CONFIG.
1	NC	3	D+
2	D-	4	GND

**10) Exit Shutter Solenoid and Sensor (CN17)**

NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.
1	ST_S1	4	ST_S2	7	GND	10	ST_SOL2
2	+5V	5	GND	8	GND	11	SOL_VCC
3	GND	6	+5V	9	SOL_VCC	12	ST_SOL1

**11) Power (CN21/CN31)**

NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.	NO.	CONFIG.
1	+24V	4	GND	7	GND	10	+5V
2	+24V	5	GND	8	GND		
3	+24V	6	GND	9	+12V		

**12) Dock (CN30)**

NO.	CONFIG.	NO.	CONFIG.
1	SW	2	GND

## 6.3 Trouble shooting

### 6.3.1 Troubleshooting Tools

The followings are the procedures for handling the problems related to the cash dispenser, which includes receiving the complaints, dispatching a technician to the branch, verifying the problem, inspecting the machine, and taking proper actions.

#### Trouble Verification

##### 1) Receiving Reports on Problems from the branch personnel

Record when the problem has occurred and what problem it is. For intermittent errors check the frequency. It is important to get the detailed transaction flow at the time when the trouble occurred, which can be very useful for resolving the problem.

##### 2) LED on the Controller Board

See if 2 LEDs are blinking on the middle of the Controller Board.

##### 3) Power LED on the Controller Board

Check if one LED on the middle of the Controller Board is illuminated and green.

##### 4) The movement of 7 segments of the Controller Board

Check if the number of 7 segment is increasing continuously or stop.

##### 5) Error Code in the Supervisor Screen

Go to the Supervisor Screen through the Rear Operator Panel and check the error code. Using the Error Code List in Chapter 15, identify the problem area and take basic actions at the branch.

##### 6) Software Journal file & Trace file

Connect the Key Board to the CE engine, enter a folder through Rear Operator Panel to get Journal file and Trace file, and send the files to Hyosung staff for further identification of the problem. However, troubleshooting through software files can take time to get the feedback due to data transmission time to Hyosung, and it requires the exact time when the trouble has occurred.

### 6.3.2 Scope of Repair at the Field Level (Recommendations)

The scope of repair that can be supported at the field level is limited only to fixing communication or power cable problem, removing note jams, checking motor, sensor or controller board problems, and adjustment/lubrication/cleaning. For problems with other components, replace the module and inspect and fix it at the Depot level.

This is just a recommendation and can be adjusted depending on the field conditions or the capability of the technician involved.

NO	FIELD REPAIR ITEMS	TOOL	REMARK
1	Communication Cable	Slotted Screw driver, a voltmeter	
2	Power Cable		
3	Note Jam		
4	Too many Rejected bills		
5	Replacement of Cash Cassette	Q-tip, alcohol, swab	
6	Motor, Solenoid, Micro-Clutch	Slotted Screw driver, a voltmeter	While checking the Motor is possible, replacing it is not.
7	Sensor		
8	Controller Board		
9	Mechanical Adjustment		
10	Lubrication	Recommended lubrication	
11	Cleaning	Air blower, Q-tip, alcohol, swab	

Items not included above cannot be checked or repaired in the field. Replace the entire unit and repair it at the Depot level.

### 6.3.3 Troubleshooting Procedure

- 1) When arriving at the branch which reported the complaint, identify the problem focusing on the module where trouble has been reported. For further details, refer to Chapter 10.Error code and Troubleshooting. If the problem lies in the cash dispenser, move to the next step described below.
- 2) Enter the Supervisor Mode and check the Status LED on the initial screen. Check to see if the error field contains a red light and there is an error code displayed at the bottom of the screen. If there is an error code on the screen, identify the type of error by checking the error code table in the manual.
- 3) If no error code appears on the screen, enter the Technician Mode to initialize the system or conduct a functional test to see if the same problem occurs.
- 4) Using the error code information in the manual, identify the items with potential problems and determine whether the repair can be supported in the Field.
- 5) If the problem falls into the category of the field repair items, take immediate actions following the procedures described in Chapter 6.3.3.1~9. If not, replace the cash dispenser.
- 6) When replacing the Cash Dispenser, acquire and store the log file in the following directory.  
 C:\Common\logs\NHTrace (from GCAT8.0 version)  
 C:\Program Files\Nautilus Hyosung\Trace

#### 6.3.3.1. Communication Problem

- 1) Check if two LEDs(TxD, RxD) and two 7 segment at the CDU Controller Board blink or increase number.
- 2) See if USB Communication cable is properly plugged on the CE engine and CDU controller, and then unplug and plug again. Check whether the cable coating has been peeled off or the cabling is proper.
- 3) Go to the Operator Panel, enter the Start>Control Panel>Device Property, and see if the CDU inside the USB3-USB 1Hub is properly set up.
- 4) Replace the CDU Controller Board.
- 5) Replace the CE engine.

### 6.3.3.2 Power Problem

- 1) Check if the LED(PWR) at the CDU Controller Board is on.
- 2) Measure the voltage of CDU Controller Board using a voltmeter, to see if it has normal voltage output. Please refer to the Section 8) Main Power (CN9) on Chapter 6.2.3.3
- 3) Change the CDU Controller Board.
- 4) Look at the LED status of the Power Supply and replace it if there is any problem.

### 6.3.3.3 Bill Jams

- 1) Power off the machine and pull out the CDU rail to the full extent.
- 2) Remove any debris or bills jammed in the transportation path,
- 3) While removing the jammed bills, check if the Roller Belt is in the right position since it could be detached from the Roller during the Jam process.

#### [WARNING!]

**If the belt is detached from the Roller, the lifespan of the belt can be dramatically reduced which can result in breakage. Therefore, it is extremely important to check if the belt is positioned at the right place after removing the jammed bills.**

### 6.3.3.4. Motor, Solenoid, Micro-clutch

- 1) Verify if the coil resistance value is normal by checking the Motor Connector with a voltmeter after turning off the power. If the coil resistance is "0" or "infinite," replace the entire Motor.
- 2) After turning on the power button, check the voltage of the motor during the operation and see if the voltage shows consistent figure.  
-> If the voltage at the Motor Operation command is "0," verify if the cable connection is proper.
- 3) Replace the CDU Controller board.

### 6.3.3.5. Sensors on Transport path

- 1) After turning on the power, block the sensor with a test bill. The normal voltage is 0~2.0V in the blocked condition. If it is over 2.0V, clean the sensor to get the voltage down. If the voltage doesn't go down below 2.0V after cleaning, change the sensor.
- 2) 9.5~12.0V is normal voltage value for unblocked condition when the bill is removed from the sensor.

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-> If the voltage value is below 9.5V, clean the sensor. If voltage doesn't increase after cleaning, change the sensor.

	BLOCKING SENSOR	UNBLOCKING SENSOR	RECOMMENDED ACTION
<b>Stable region</b>	<b>0 ~ 2V</b>	<b>9.5 ~ 12V</b>	1st action : Cleaning (three times)
Unstable region	2 ~ 6V	6 ~ 9.5V	2nd action : Replacing with new sensor

**[Note!] For the sensors not on the transport path, refer to the specifications described in Chapter 6.1.3.3 The Judgment Criteria for Sensor.**

**6.3.3.6 Controller Board**

If the following conditions occur, replace the Controller Board.

- 1) When turning on the ATM power, the RxD LED in the Controller board flashes a few times but TxD LED doesn't flash at all.
- 2) Strange letters (eg. r,p,...) appear on the 7 segments of the Controller Board
- 3) When having problems with communication, voltage, electromagnetic component (Motor, Solenoid, Micro-clutch), sensor, power from the Controller Board is abnormal while the cables and other components operate properly.

**6.3.3.7 Mechanical Adjustment**

: Refer to Chapter 6.4.

**6.3.3.8 Lubrication**

: Refer to Chapter 6.5.2.

**6.3.3.9. Cleaning**

: Refer to Chapter 6.5.1.

### 6.3.4 Common Occurred Problems

#### 1) Bill jams

Turn off the power, pull the CDU rail to the full extent, and identify the jamming point. Bill jams occur more frequently inside the Cash cassette or areas nearby the Vertical Transportation Path, Gate solenoid, Reject box entry, and Upper Transport Path. Turn the Green Knob on the bottom right side to move the bills forward, and remove the notes by hand. If the bill does not move when turning the Knob, pull the jammed bill from the machine by hands. Make sure that the belt is not moved from its original position.

#### 2) Bad bill picks

When bad bills are picked, two types of problem can occur. The first problem appears when a large number of bills in the Reject Box are diverted and the reject rate increases. This can cause bill jams in the transport path if the bad bill problem becomes serious.

The steps to follow for high reject rate are as follow.

Step 1: Check the condition of bills inside the cash cassette (see if bad bills or sticky bills exist)

Step 2: Conduct the Roller (G,P,F Roller) Cleaning inside the cash cassette.

Step 3: Replace the Cash cassette (Field Technician).

Step 4: Find out the cause of the reject, using the Diagnostic program for Depot (Depot Level), and check the bill denomination set in the CDU Main Board.

Step 5: Send the cash cassette that contains a problem to Hyosung ( Check and adjust the Pick-up Overlap.

#### 3) Cassette not fully inserted

CDU cassette not complete docked

#### 4) Not sensing cassette and/or its type

Not sensing reject box

Sensor pollution

Bad sensor

Refer to Chapter 6.5.1 for the cleaning methods against the sensor pollution and replacement criteria of bad sensors, and Chapter 6.6.2 for sensor replacement methods.

## 6.4 Mechanical Adjustment

When disassembling or assembling any components or assemblies in the field, it is essential to follow the proper adjustment specifications recommended by Hyosung, since this can have a critical impact on the lifespan of the component. If the adjustment is incorrect, the problem may not appear during the initial test, but the lifespan of the component can be shortened considerably. In addition, incorrect adjustment can cause such problems such as bill jams, high reject rates or note damage.

SECTION	LOCATION DETAIL	REMARK
Belt tension	Drive Belts Tension of Body Module to Feed Module Drive Belts Tension between Feed Modules Drive Belts Tension of Upper Transport	
Gate Shutter	Gate Shutter Solenoid	For both field technician and depot Level
Exit Shutter	Exit Shutter Solenoid	
Cassette Guide	Width Guide and Height Guide	
Cassette Overlap	Overlap length between Feed Roller and Gate Roller	Factory Adjustment Only

#### 6.4.1 Belt Tension Adjustment

The objective of all belt adjustments is to remove any slack without stretching the belt. On the Feed module and body module, provision is made for the adjustment of five drive belt tensions. Loose belt tension can cause continuous frictions and abrasions between the teeth of pulley and belt, which ultimately reduces the lifespan of the belt dramatically. Therefore, it is critical to properly adjust the belt tension.

##### 1) Drive Belts Tension of Body Module to Feed Module

- ① First, place the belt in the direction shown in the below picture, and assemble the Idle Tension Bracket at the end of the assembly process.
- ② Put the embossing behind the Idle Tension Bracket inside the square home, and push it in the direction of the arrow. Slightly snug the M4 screw.
- ③ Adjust the Idle Tension Bracket so that the belt tension at the longest belt point has the tension of about 400~600g, and tighten the screw completely. Make sure that the screw is not loose which can loosen the belt tension.
- ④ Slowly turn the Green Knob and double check if any belt vibration exists.

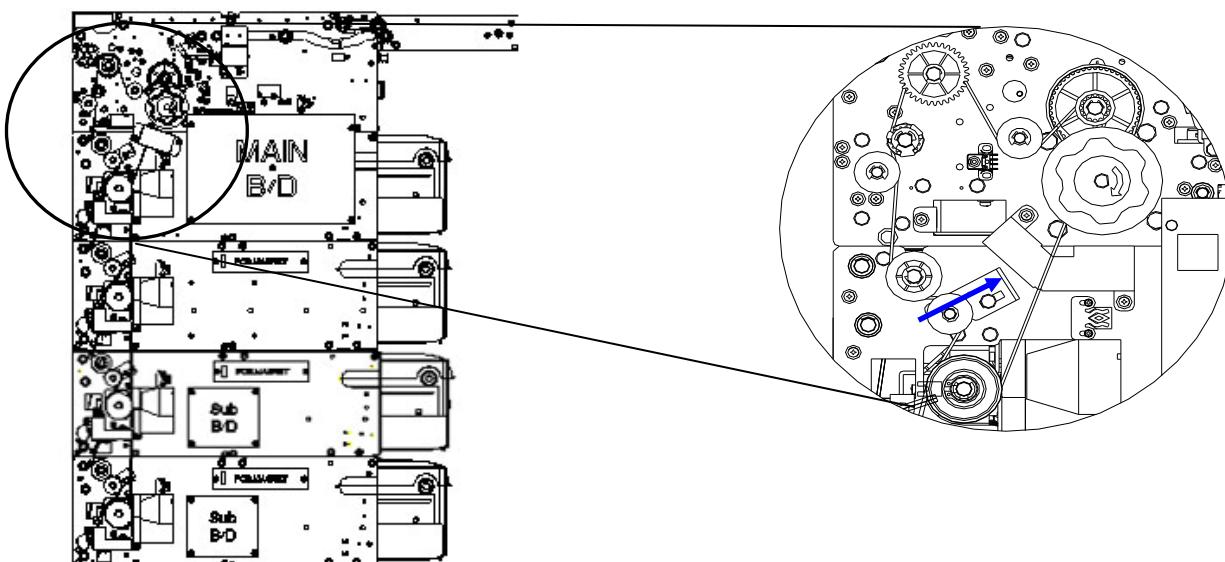


Fig. 6.8 Belt Tension Adjustment (1)

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**2) Drive Belts Tension between Feed Modules (3 places)**

- ① First, place the belt in the direction shown in the diagram below, and assemble the Idle Tension Bracket at the end of the assembly process.
- ② Put the embossing behind the Idle Tension Bracket inside the square home, and push it in the direction of the arrow. Slightly snug the M4 screw.
- ③ Adjust the Idle Tension Bracket so that the belt tension at the longest belt point has the tension of about 400~600g and then tighten the screw completely. Make sure the screw is not loose which can loosen the belt tension.
- ④ Slowly turn the Green Knob and double check if any belt vibration exists.

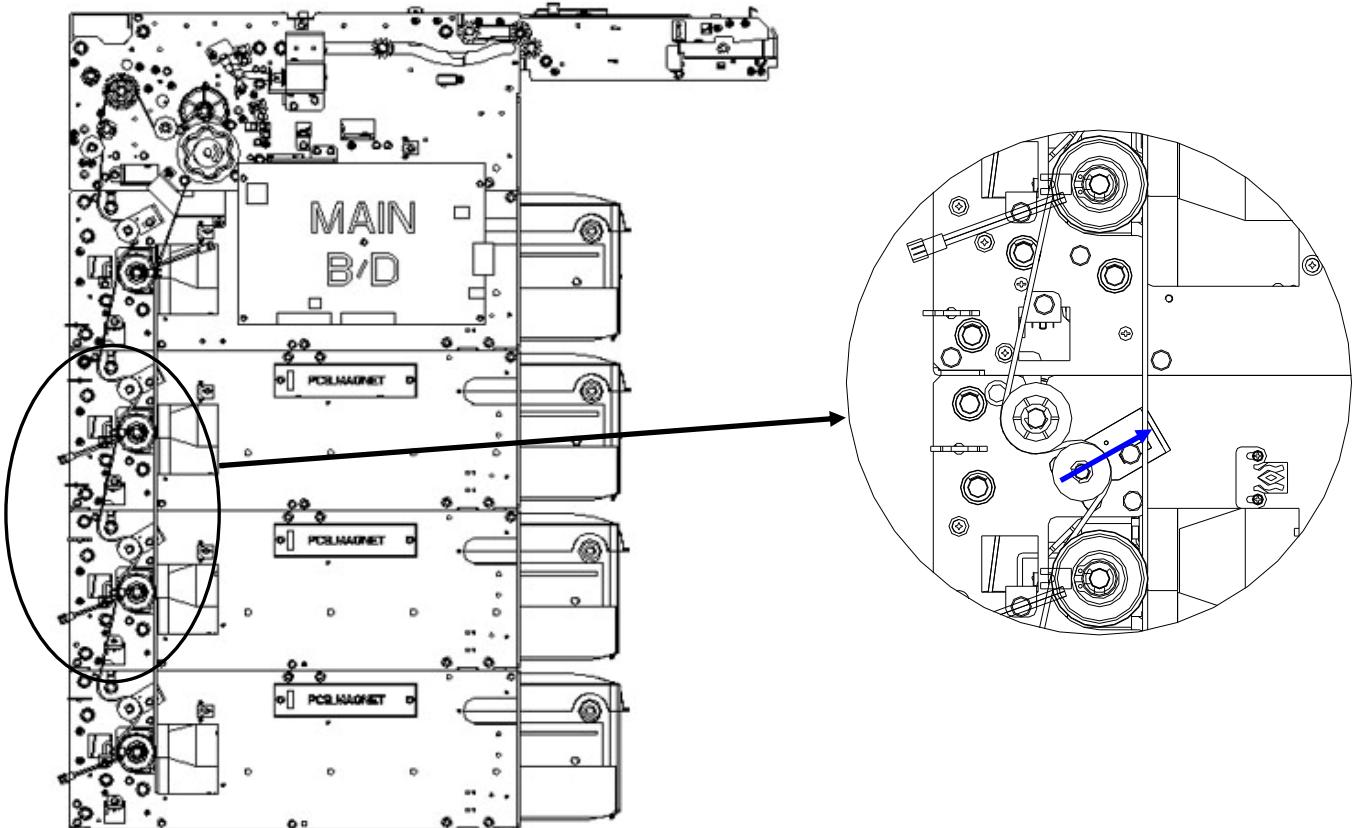


Fig. 6.9 Belt Tension Adjustment (2)

### 3) Drive Belts Tension of Upper Transport

- ① First, place the belt in the direction shown in the below, and assemble the Idle Tension Bracket at the end of the assembly process.
- ② Put the embossing behind the Idle Tension Bracket inside the square home, and push it in the direction of the arrow. Slightly snug the M4 screw.
- ③ Adjust the Idle Tension Bracket so that the belt tension at the longest belt point has tension of about 400~600g and tighten the screw completely. Make sure the screw is not loose which can loosen the belt tension.
- ④ Slowly turn the Green Knob and double check if any belt vibration exists.

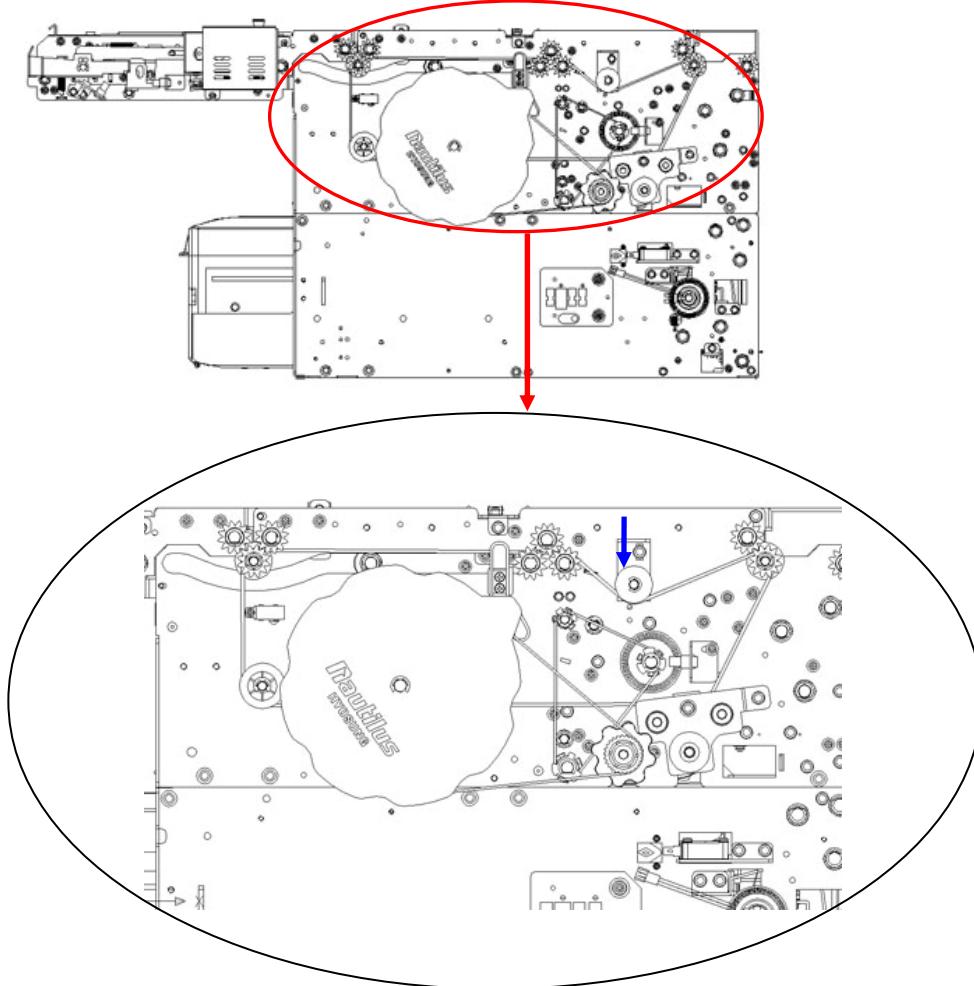


Fig. 6.10 Belt Tension Adjustment (3)

#### 6.4.2 Gate Shutter Adjustment

- ① Loosen the solenoid M4 screw (2 places) as much as possible.

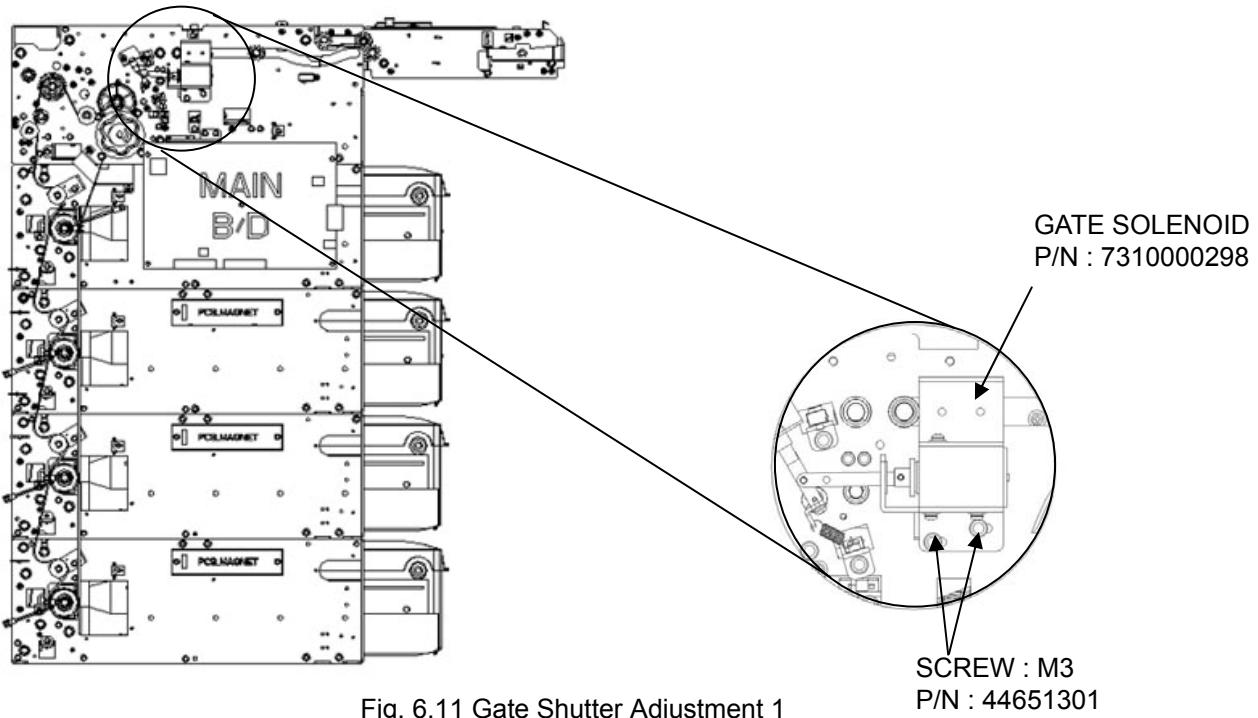


Fig. 6.11 Gate Shutter Adjustment 1

- ② Adjust the solenoid position so that the solenoid damper is at least 3.0mm away from the solenoid plunger when you pull the gate as shown in the below right figure  
 ③ Adjust the solenoid bracket so that the gate upper is at least 3.6mm away from the guide as shown in the below left figure  
 ④ Tighten the solenoid M4 screws (2 places).

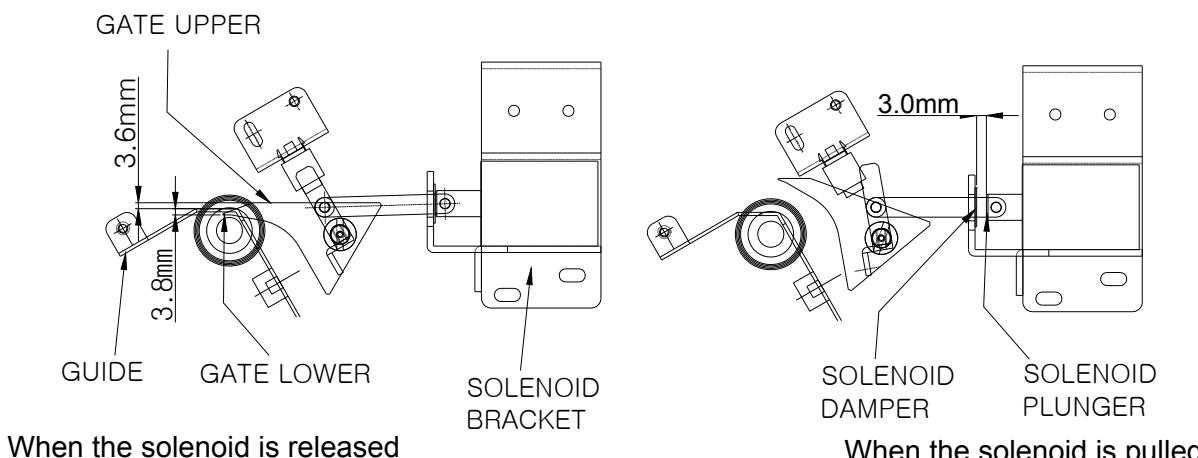


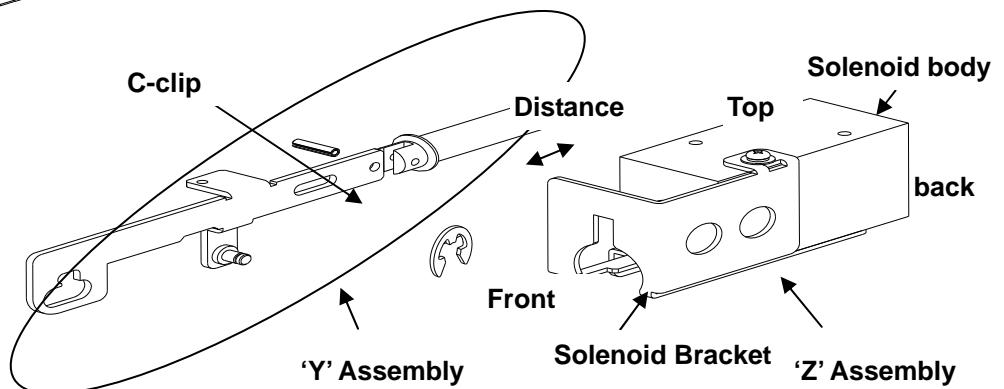
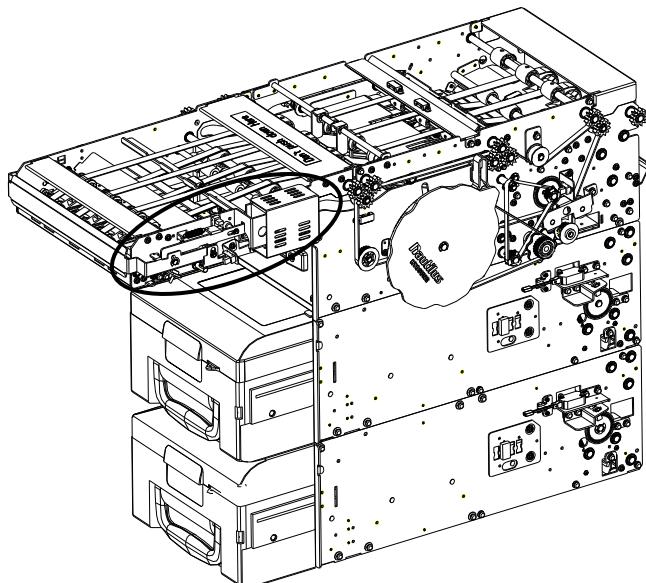
Fig. 6.12 Gate Solenoid Adjustment 2

#### 6.4.3 Exit Shutter Adjustment

- ① When joining the Solenoid Body and the Solenoid Bracket, tighten the screws at top one place and bottom two places about halfway through, and then minimize the distance between the Body and Bracket and fully fasten the screw.
- ② When attaching the “Z” Assembly to the FRAME, insert “Y” Assembly to “Z” Assembly, having them done horizontal with each other, and tighten the screw to the full extent.
- ③ Adjust the distance between Y Assembly and Z Assembly to 7.8mm from the end of Solenoid flanger C-clip to Solenoid Body.

**[WARNING!]**

The ‘Y’ assembly value is supposed to become normal again by the spring. However, it is important to check the “alignment” because problems can occur if the Flanger of the Solenoid has not been connected horizontally.



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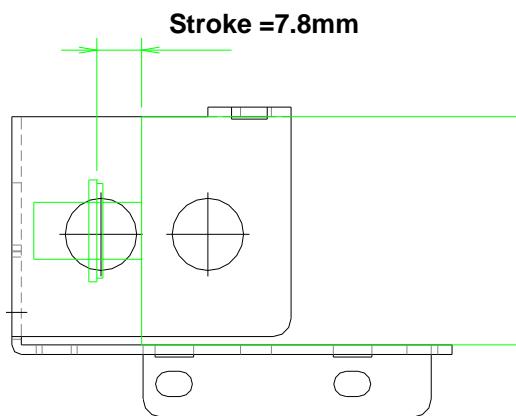


Fig. 6.13 Exit Shutter Solenoid Adjustment

#### 6.4.4 Cassette Guide Adjustment for Multiple Denominations

##### 6.4.4.1 The Upper Guide Setting Specification.

Use the table below to set the note height

Table 6.1 The Upper Guide Setting Specification

NO	NOTE HEIGHT	THE NUMBER OF SPACER	BOLT SPEC.	BOLT PART NUMBER.	THE LENGTH OF SCREW	NOTE
1	Greater than 74mm Less than 78mm	GUIDE	SCR M3*5 BLACK	44620105	5mm	
2	Greater than 71mm Less than 74mm	GUIDE + SPACER 1	SCR M3*8 BLACK	44621304	8mm	
3	Greater than 68mm Less than 71mm	GUIDE + SPACER 2	SCR M3*11 BLACK	44620106	11mm	
4	Less than 68mm	GUIDE + SPACER 3	SCR M3*14 BLACK	44621604	14mm	US Dollar

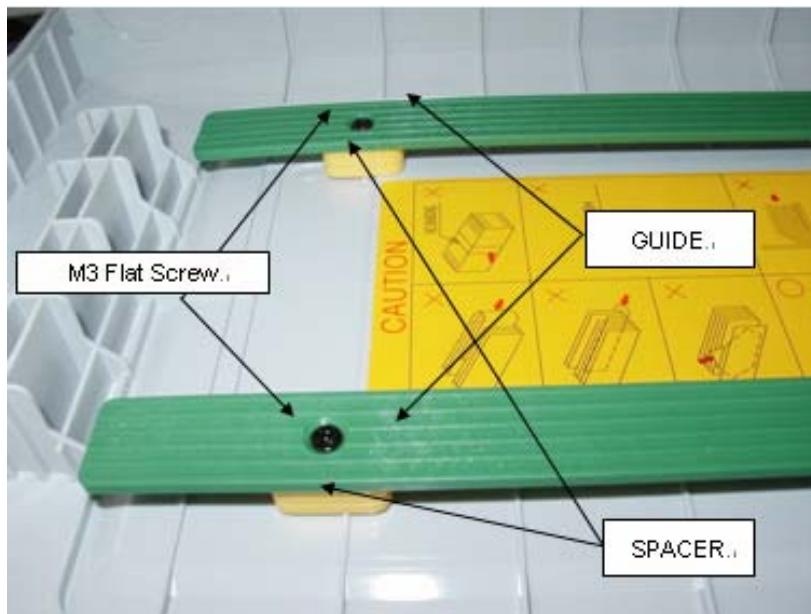


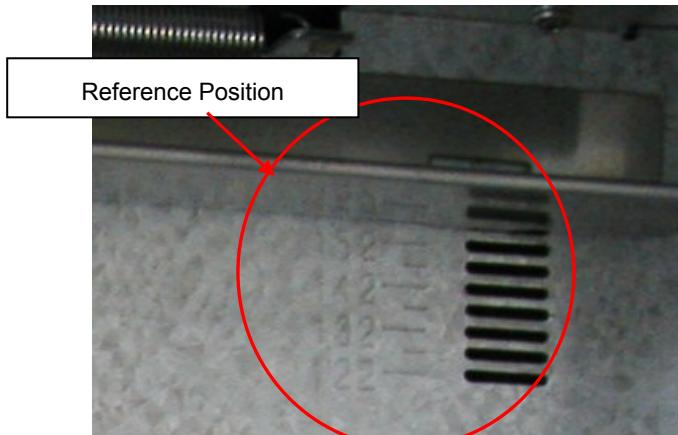
Fig. 6.14 Example of the Upper Guide Setting (Dollar-66mm)

**6.4.4.2 The Side Guide Setting Specification.**

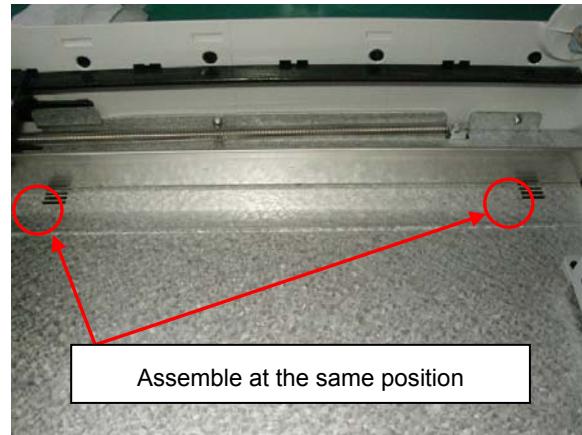
- 1) Set the bill width to the reference position according to the width of the note to be dispensed.

Table 6.2 The Side Guide Setting Position

NO.	BILL WIDTH	REFERENCE POSITION	NOTE
1	Less than 122mm	122	
2	Greater than 122mm ~ Less than 127mm	127	
3	Greater than 127mm~Less than 132mm	132	
4	Greater than 132mm~Less than 137mm	137	
5	Greater than 137mm~Less than 142mm	142	
6	Greater than 142mm~Less than 147mm	147	
7	Greater than 147mm~Less than 152mm	152	
8	Greater than 152mm~Less than 157mm	157	US Dollar
9	Greater than 157mm~Less than 162mm	162	
10	Greater than 162mm~Less than 167mm	167	



Picture 2



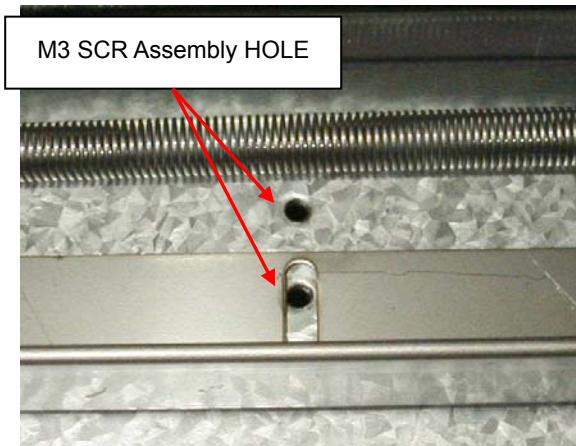
Picture 3

Fig. 6.15

- 2) Put the hook parts of Side Guide into the holes of the Guide Assembly Position, and then push it toward the pick-up assembly until you can see the screw hole. (Picture 4)  
In case the bill width is greater than 150mm,  
: Put the Side Guide under the Push-Spring and then insert the hook parts into the holes of Guide Assembly Position – Picture 5)

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**6. Cash Dispensing Unit**



Picture 4



Picture 5

Fig. 6.16

3) Assemble the SCR:PH(+):S/W:F/W(L):M3\*6:W/Zn in the M3 Screw Assembly Hole



Fig. 6.17

## 6.5 Preventive Maintenance

### 6.5.1 Cleaning

In order to prevent problems caused by sensor pollution and pick errors, the Sensor and Roller should be cleaned hopefully. The cycle of the cleaning varies depending on the function, location, and degree of pollution of the component.

NO.	LOCATION	INT.	REMARK
1		CS1 D,T / CS4D,T / CS10 (A,B)D,T / CS13D,T	M3
2	Body and Feed Module in Cash dispenser	CS11(A,B)D,T / CS21(A,B)D,T CS31(A,B)D,T / CS41(A,B)D,T / CS14D,T / CS3 / CS8 CS19 / CS29 / CS39 / CS49 CS17 / CS27 / CS37 / CS47 CS2 / CS9D / CS16 / CS26 CS36 / CS46 / CS15 / CS6 CS18 / CS28 / CS38 / CS48 CS12 / CS 22 / CS32 / CS42	M6
3	Pick up Module in Cassette	Pick-up Roller Feed Roller Gate Roller	M3
4		Rubber of Pick-up Roller	Y2 or 1,000,000 count

\* M3 : Once every 3 months M6 : Once every 6 months

Y1 : Once a year

Y2 : Once every two years

### 6.5.2 Lubrication

- Check the oiling status before running or storing it. In case there is any part lack of lubricant, apply lubricant to the corresponding part in compliance with oiling standard.
- Apply grease only if necessary during the regular field inspection. In case there is enough lubricant, do not apply additional lubricant. However, if lubricant is contaminated, remove alien substances from lubricant before applying it to the machine.
- All pivot points and frictions parts must be oiled.
- All points except the following must be oiled:  
Printing head, Magnetic head, Package, Micro switch contact, Drive roller, Timing pulley, and Timing belt
- All oiling operations must be based on oil drop unit. However, when contact between the oiling device and the oiling target is not avoidable, the contact time must not exceed one second.

#### [NOTE!]

- Lubricant must not leak. In other words, lubricant must be applied only to the parts that need oiling. Do not apply excessive lubricant. Lubricant must not contaminate other parts. **Be careful that the micro switch, the sensor, the timing pulley, the timing belt, the package, the printing head, and the magnetic head are protected from lubricant.**
- Do not clean plastic parts or protection devices with alcohol and other agents than the designated one.
- Remove dust, oil, and grease from the machine, and clean the machine with dry soft cloth.
- Be careful that the paper contact part in the paper path is protected from lubricant.

Table 6.3 Oiling Standard

NO.	LOCATION	LUBRICANTS	INTERVAL	REMARK
1	Tension Pulley	Mobil (1)	Y1	Lubricate the friction part between shaft and pulley
2	Gear support gear teeth surface	AlbaniaGreaseEP1	Initial Oiling	-
3	Gate spring hook	AlbaniaGreaseEP1	Initial Oiling	-
4	Gear support spring hook	AlbaniaGreaseEP1	Initial Oiling	-
5	Pick-up Module gear teeth surface	AlbaniaGreaseEP1	Initial Oiling	-

\* Y1: Once a year.

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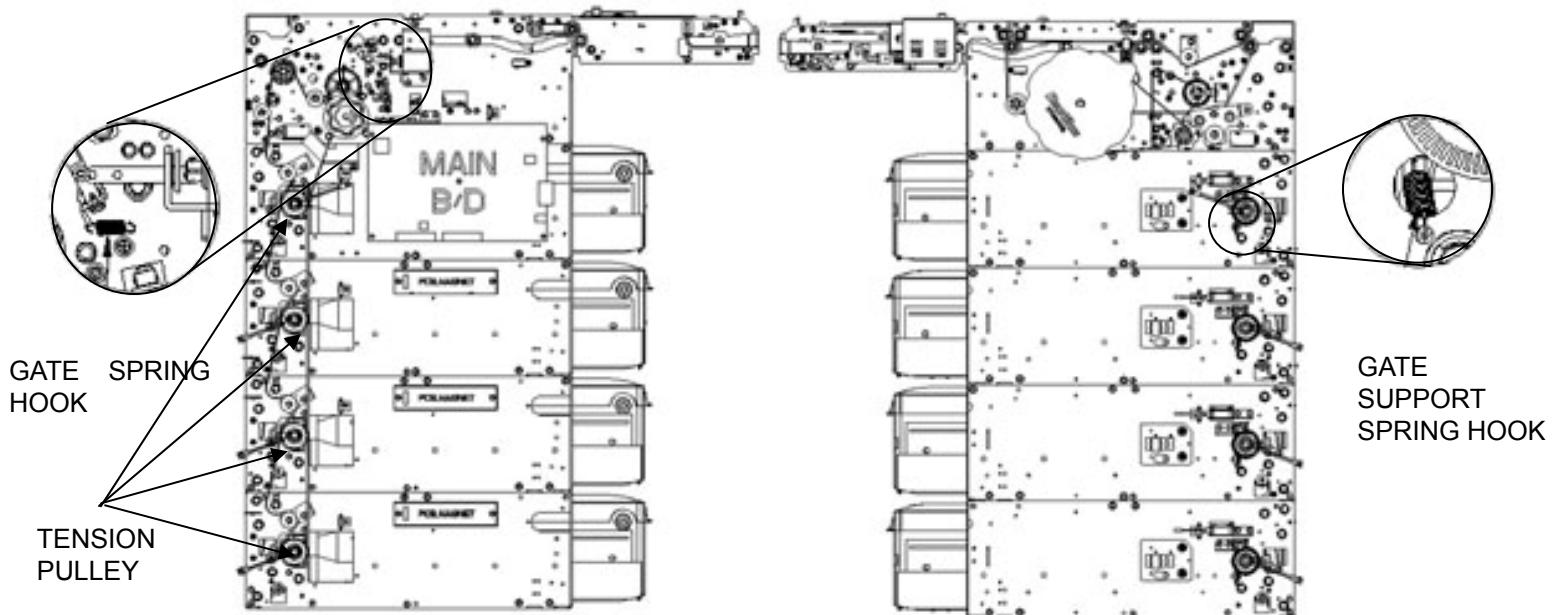


Fig. 6.18 Lubrication 1

2) Gate Support Gear Teeth Surface

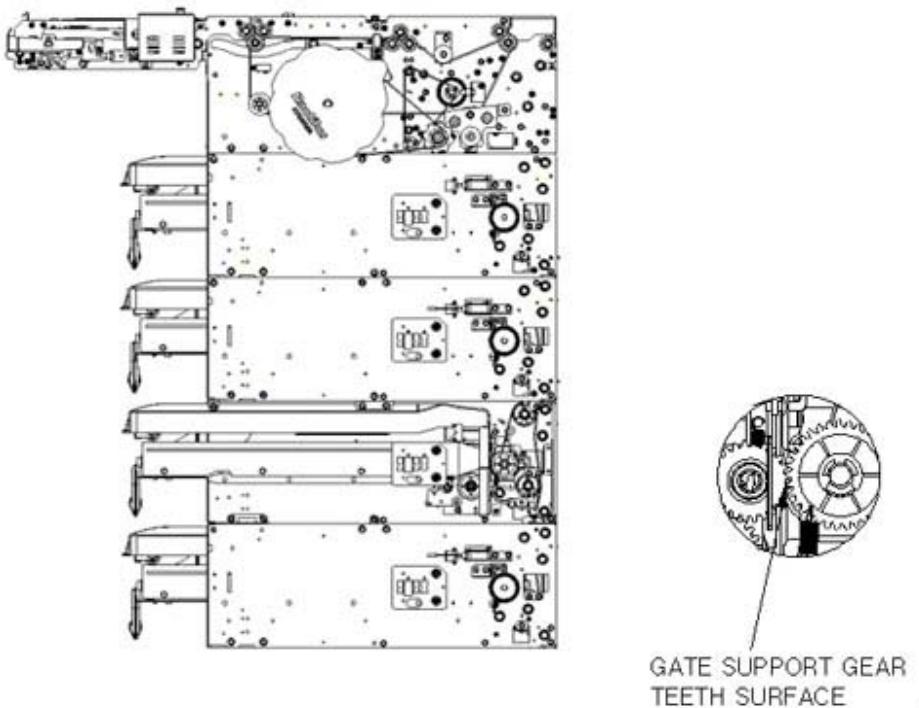


Fig. 6.19 Lubrication 2

**3) Pick-up Module Gear Teeth Surface**

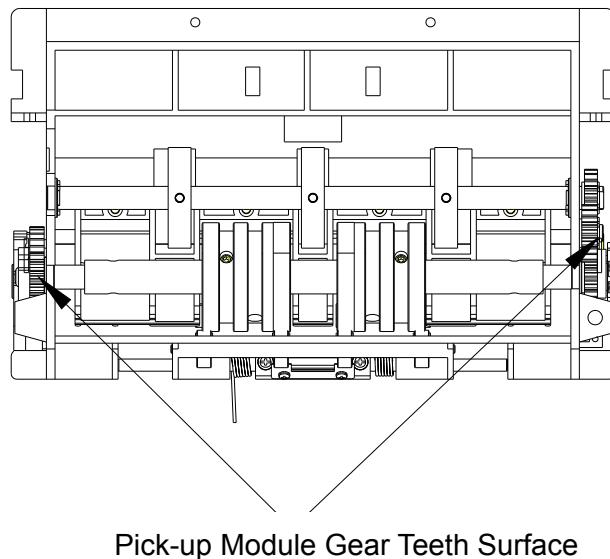


Fig. 6.20 Lubrication 3

### 6.5.3 Switch Settings



Fig. 6.21

#### 6.5.3.1 Dip Switch on Controller Board

DIP SWITCH								DESCRIPTION
1	2	3	4	5	6	7	8	
On	On	On	On	On	On	On	On	Transaction Mode
Off	On	On	On	On	On	On	On	Program Download Mode (Refer to below about how to download)
On	Off→ On	On	On	On	On	On	On	Automatic Sensor Default mode (Refer to below about how to use it)
On	On	Off→ On	On	On	On	On	On	Automatic Sensor Adjustment mode (Refer to below about how to use it)

※ How to download Cash Dispenser Program

- ① Turn power off
- ② Completely put ROM Pack board for downloading into CDU main board
- ③ Turn on the No 1 DIP switch and then turn power on power supply
- ④ Check 7 segments changing as follows  
: 'L0'→'L6'→'L7'→'0' or Off
- ⑤ Turn power off and carefully remove ROM Pack board.
- ⑥ Turn off No 1 Dip switch
- ⑦ Turn on power and initialize CDU

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\* In case No2 or No3 switch will be used

- ① When the sensor (**CS4, CS10, CS13, CS14**) is clean : The 'Initialize' button on Cash Dispenser diagnostic mode should be pressed



- ② When the control board is replaced :

Execute Dip switch 2 Off/On and Dip switch 3 Off/On

- ③ When sensor error occurred :

- Check if there remain dusts or unknown objects on sensor, and the remove them completely.
- Press the 'Initialize' button on Cash Dispenser diagnostic mode
- If error is not clear in case above actions are taken  
: Run the Automatic Sensor Adjustment mode (**Dip switch 3 Off/On**)

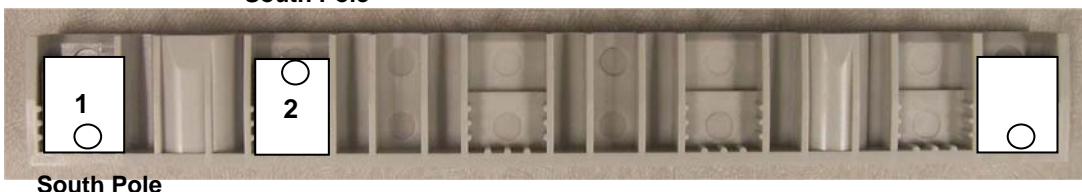
### 6.5.3.2 Cash Cassette Magnet Configuration

Inside the Cash cassette cover, there is a magnet that recognizes the Cassette ID on the left frame, and through this magnet configuration, the cash dispenser correctly identifies the Cassette ID. In case the Cash Cassette ID is not recognized, check first if the magnet configuration is set up properly. In order to change the Cash Cassette ID, rearrange the magnet configuration referring to the Magnet Configuration Table below.

#### - Cassette ID 1

1	2	3	4	Reserved	Reserved

South Pole

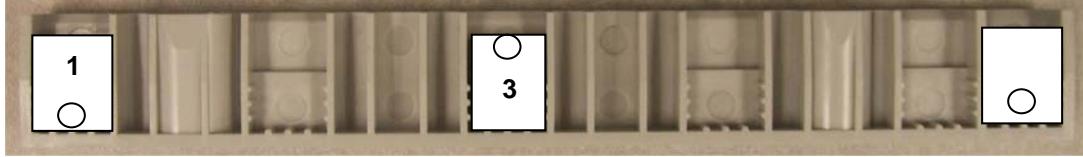


South Pole

#### - Cassette ID 2

1	2	3	4	Reserved	Reserved

South Pole



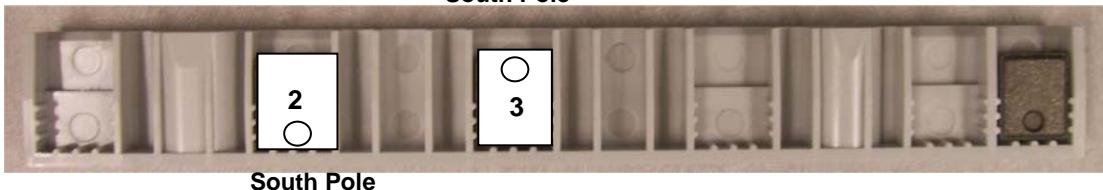
South Pole

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- Cassette ID 3

1	2	3	4	Reserved	Reserved

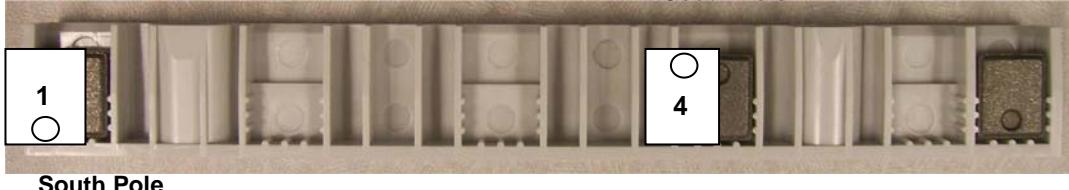
South Pole



- Cassette ID 4

1	2	3	4	Reserved	Reserved

South Pole



- Cassette ID 5

1	2	3	4	Reserved	Reserved

- Cassette ID 6

1	2	3	4	Reserved	Reserved

- ① Open the cassette cover.
- ② Loosen the M3 fixing screw (2 places) on the magnet base bracket.
- ③ Remove the magnet base bracket and magnet for note identification.
- ④ Replace the magnet or change the configuration to the desired ID.

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When you replace the magnet or change the configuration, make sure that it should be follow the instruction about magnet ID configuration not to have same pole with neighboring them.

- ⑤ Assemble the unit in the order of ④~①.

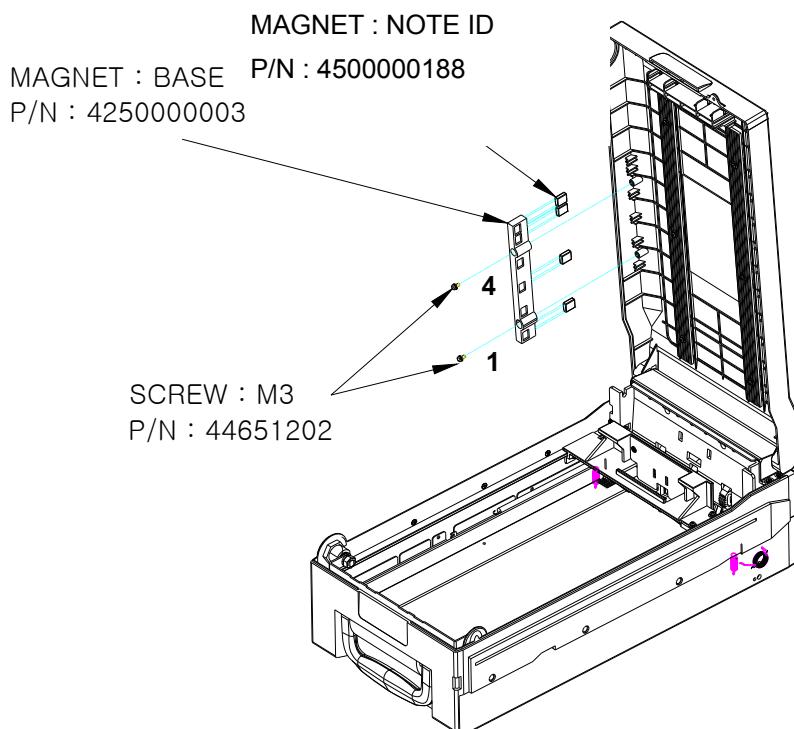


Fig. 6.22

**[WARNING!]**

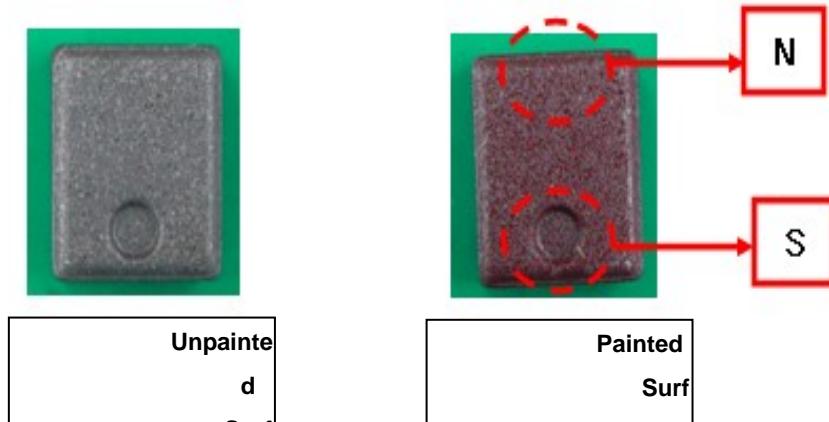
**When the magnet for note identification is replaced or changed, you should follow the assembly process to verify the cassette configuration.**

**Otherwise, the ATM machine loaded with cassette may cause dispensed errors.**

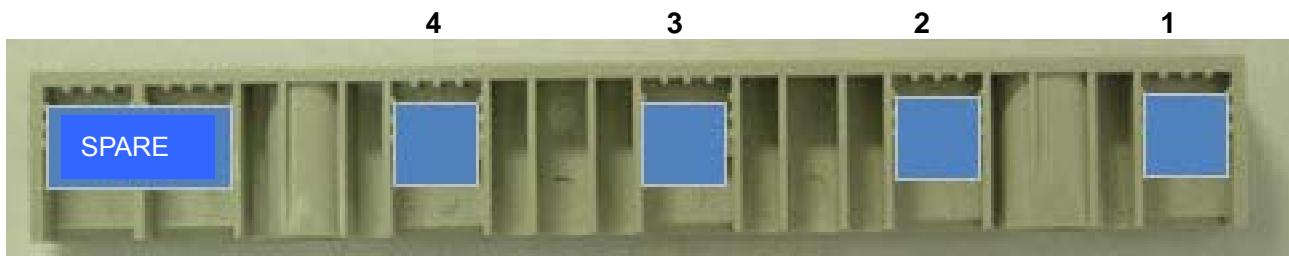
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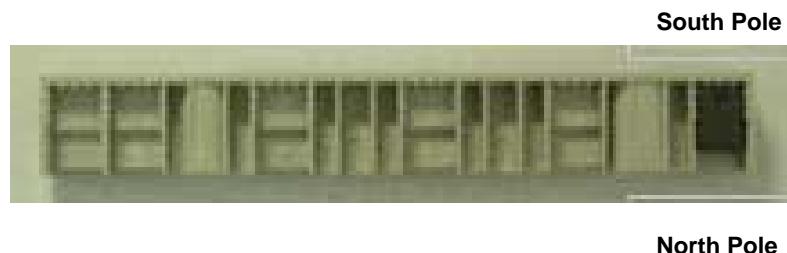
\* How to set the cassette ID magnet (Detailed Information)



① Identify the magnet location of the Magnet Base

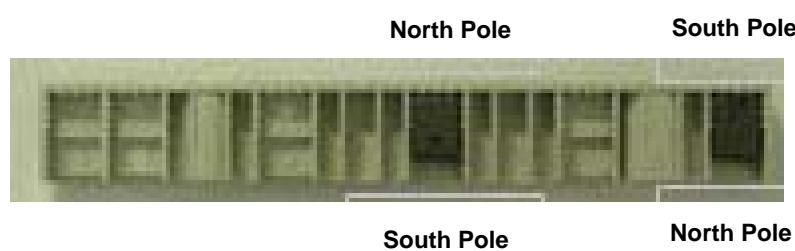


② Insert the magnet facing the unpainted surface of ID magnet to ID sensor (outside) as shown in the following picture



South Pole

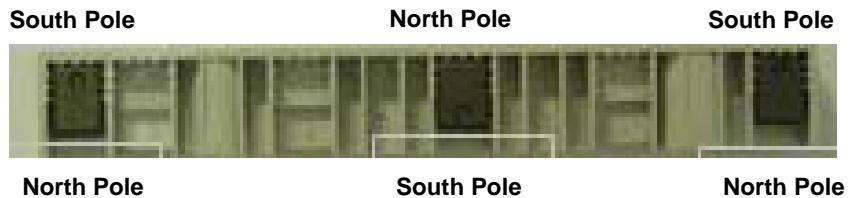
③ Insert the next magnet to have opposite pole configuration as shown in the following picture.



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- ④ As the same way, insert the spare magnet with opposite pole configuration with neighboring one.

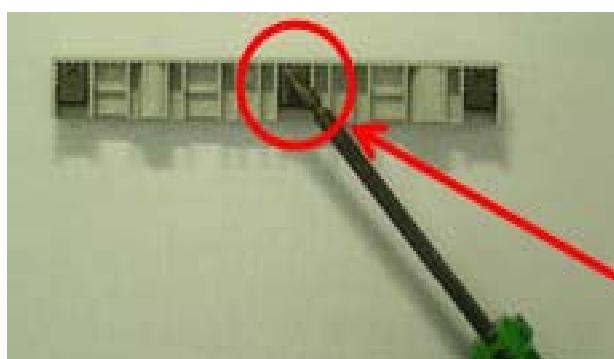


**[Checkpoints]**

- Check if the south pole of magnetic is located on opposite direction in turn
- Check if the unpainted surface of magnetic is displayed to you.



- Check if a screw driver is attracted to the magnet when it is attached, as shown the following picture



Check the driver to be attracted to the Magnet.

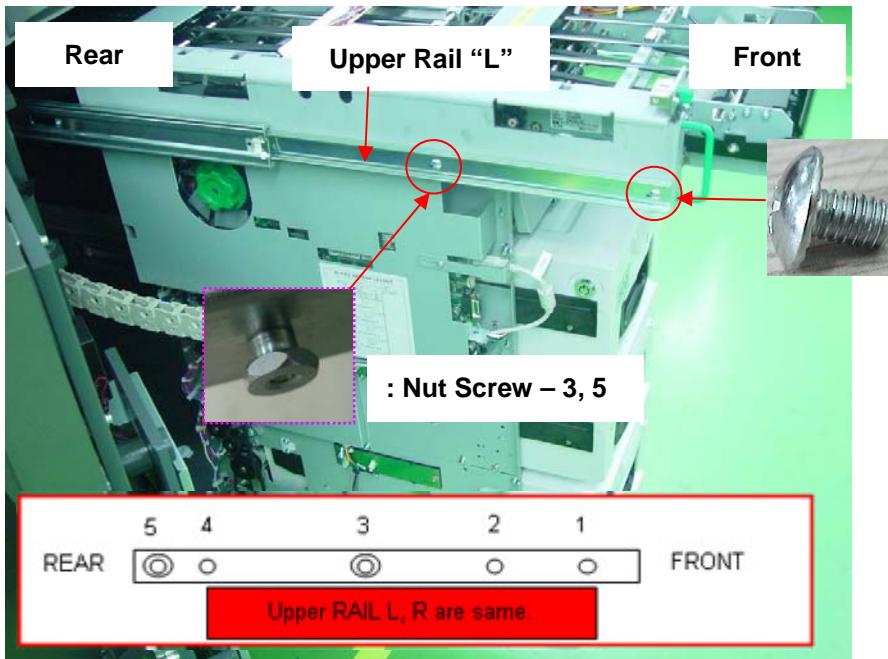
## 6.6 Removal/Installation Procedure for Field Technician

In the field, the range of repairs, which may involve disassembly and assembly of various components. In order to repair other components, the entire CDU unit should be replaced at the Depot. Note however, that this is just a recommendation and can be adjusted depending on field condition or capability of the technician.

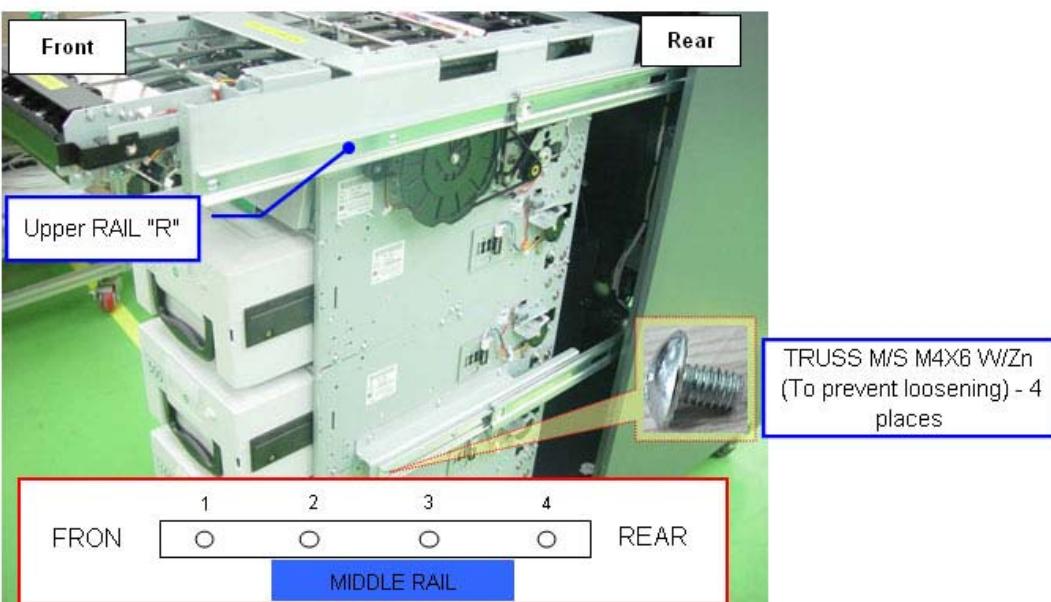
SECTION	LOCATION DETAIL	REMARK
Entire Unit	Cash Dispensing Unit	
Sensor	CS11(A,B) / CS21(A,B) / CS31(A,B)/ CS41(A,B) CS14D,T / CS3 / CS8/ CS2 / CS9D / CS19 / CS29 / CS39 / CS49 / CS15 / CS6 CS17 / CS27 / CS37 / CS47 / CS1 D,T / CS4D,T / CS16 / CS26 /CS36 / CS46 / CS10 (A,B) / CS13D,T CS18 / CS28 / CS38 / CS48 CS12 / CS 22 / CS32 / CS42	For field technician is available
Controller board		
Micro-clutch Assembly	Micro-clutch Assembly located at each cassette	
Solenoid	Gate Shutter Solenoid Exit Shutter Solenoid	
Presenter Assembly		
External Components in Cash Cassette	Latch, Push Plate	
Motor Assembly	Main Motor Cam Motor Upper Transport Motor	Depot Level only
The other components except above described.		Depot Level and Factory only

**MoniMax 5600****6. Cash Dispensing Unit****6.6.1 Assembling the Entire Unit****6.6.1.1 Assembling right and left Rail on CDU**

1. Tighten the Rail Screw as pictured below. (1, 2, 4)

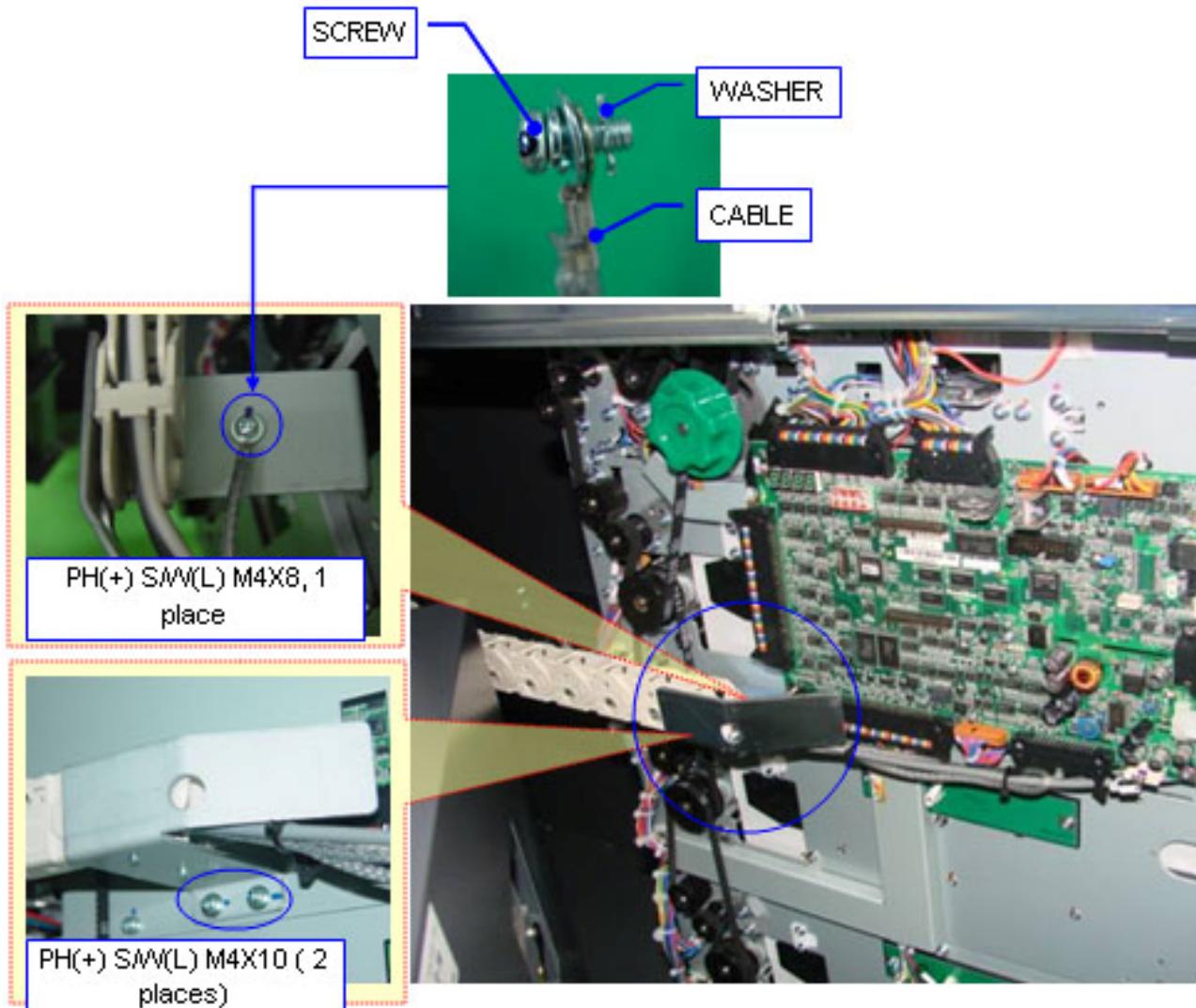


2. Screw up Middle Rail as pictured below.- 4 places



**MoniMax 5600****6. Cash Dispensing Unit****6.6.1.2 Assembling CDU Chain Bracket**

1. Connect GND Cable to the upper of CDU Chain Bracket. ->First insert the Washer and fix the GND Cable. (WASHER:EXT-TOOTH (1 place), PH(+) S/W(L) M4X8 (1 place))
2. Mount the Chain Bracket on CDU UNIT. ->PH(+) S/W(L) M4X10 (2 places)

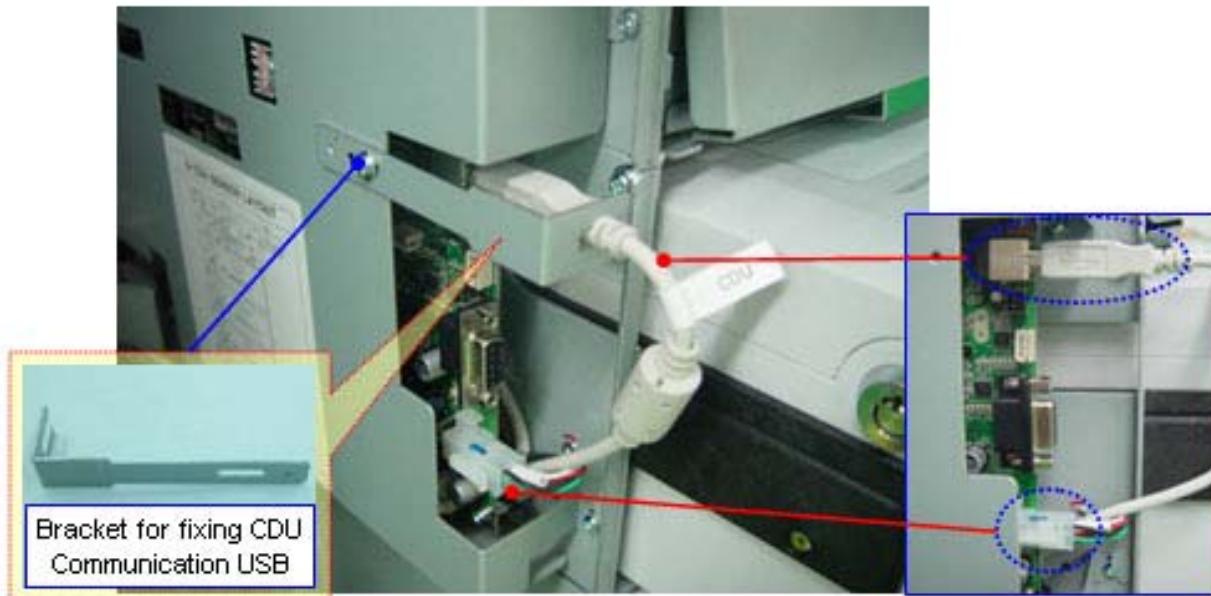
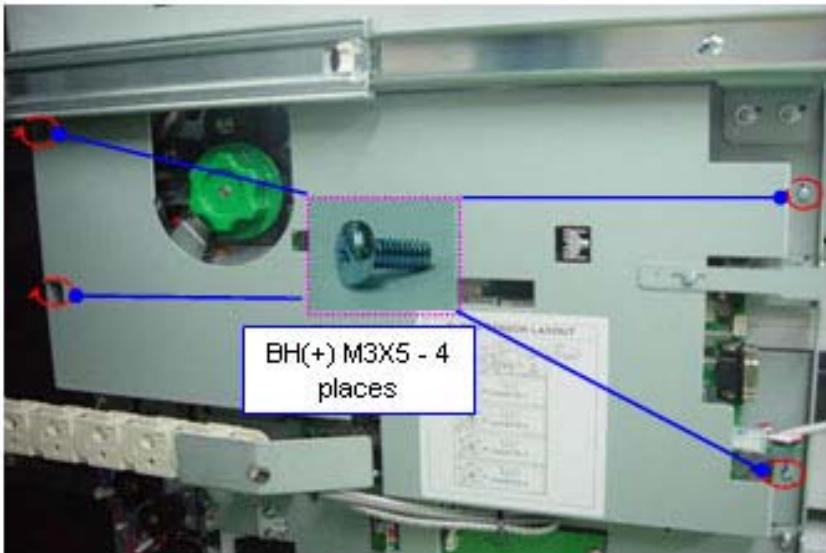


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### 6.6.1.3 Assembling the CDU Cover

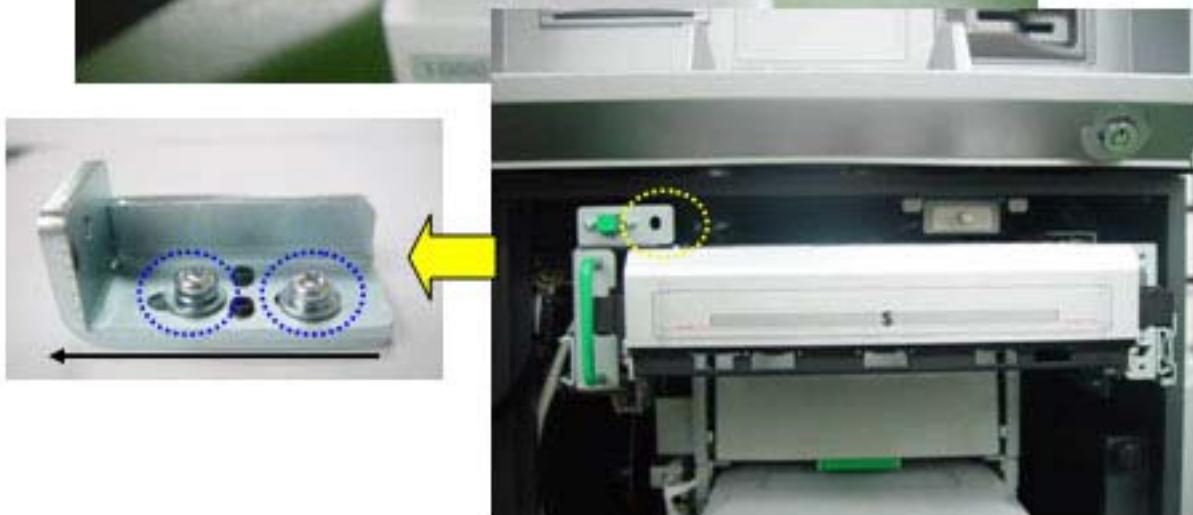
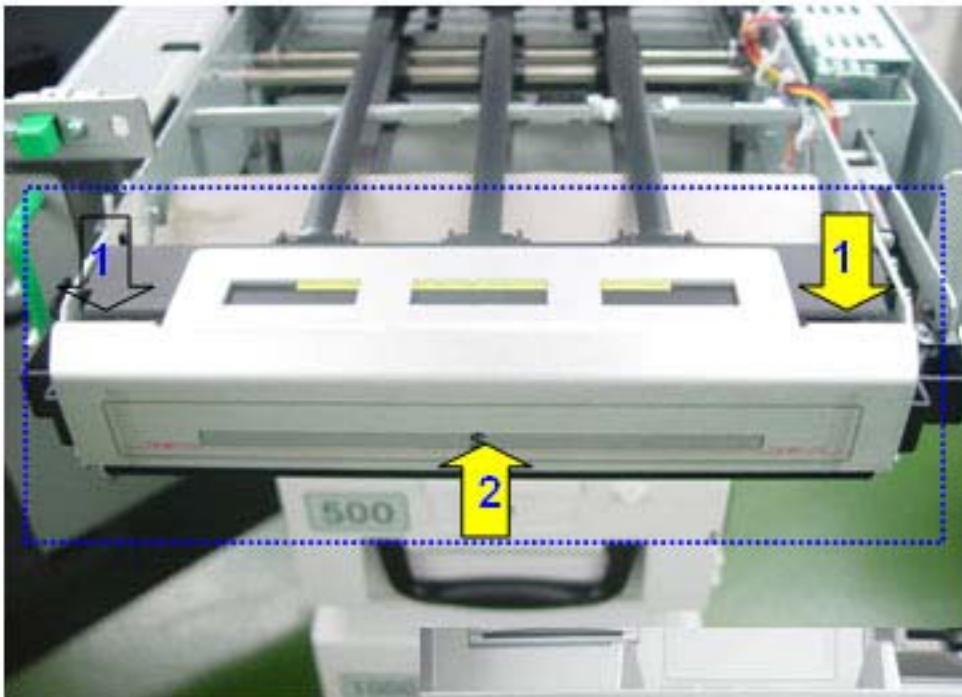
1. Mount the CDU Cover by tightening 4 BH(+) M3x5 screws.
2. Install the bracket for fixing CDU communication USB cable by tightening one PH(+) S/W(L) M3x6 screw.
3. Insert the communication USB cable and power connector.



#### 6.6.1.4 Adjusting the CDU shutter and bezel gap

##### 1) Adjusting the CDU shutter

1. Insert the JIG into the front of the CDU shutter. → Insert the JIG in the direction of “1” and adhere it in the arrow direction of “2”.
2. Screw up the lock bracket bolt by half and adhere it in the arrow direction.

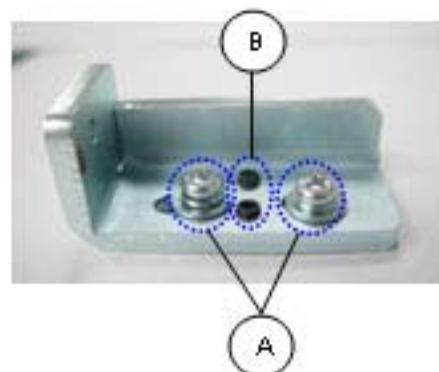


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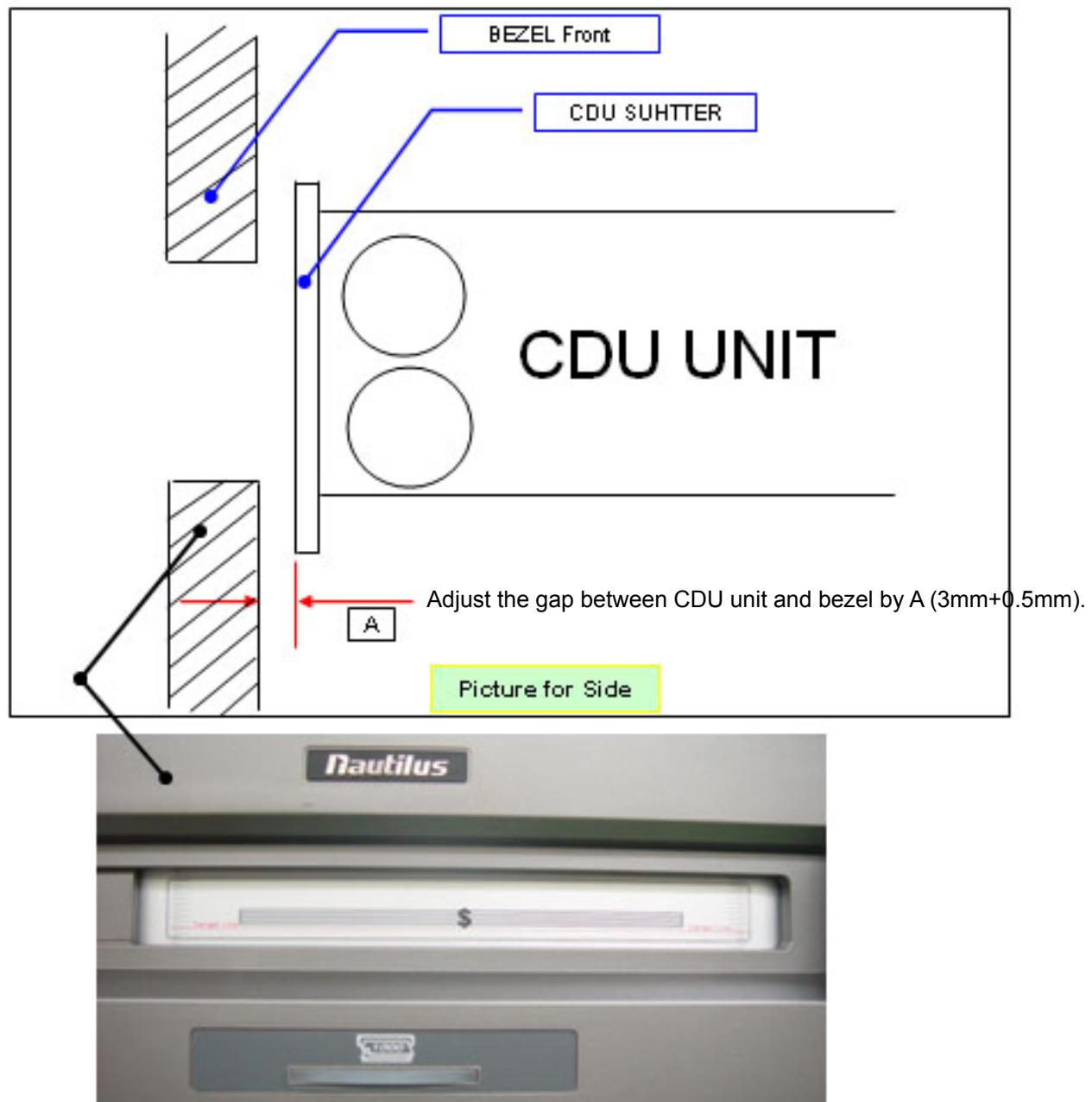
**2) Adjusting the bezel gap**

1. Place CDU unit on the right position in the arrow direction to meet the Gap between the front and rear of CDU.
2. Close the Safe door and adjust the CDU right position gap.
3. Open the Safe door.
4. Pull the CDU in the arrow direction to the end.  
(Be careful not to move Lock Bracket when pressing "PUSH LOCK".)
5. Screw up the bolts. ( In the order of A, B.)



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6. Cash Dispensing Unit



### 6.6.2 Sensor Replacement

Turn power off and remove the CDU protective cover as shown in the figure to replace sensors and modules. The CDU contains 60 sensors in total including 27 transport path sensors, 5 encoder sensors, 5 docking sensors, 4 cash low sensors , 8 bill empty detection sensors, 4 cassette identification sensors, 2 double bill detection sensors, 2 cam detection sensors, 1 withdrawal detection sensor and 2 gate operation detector sensor.

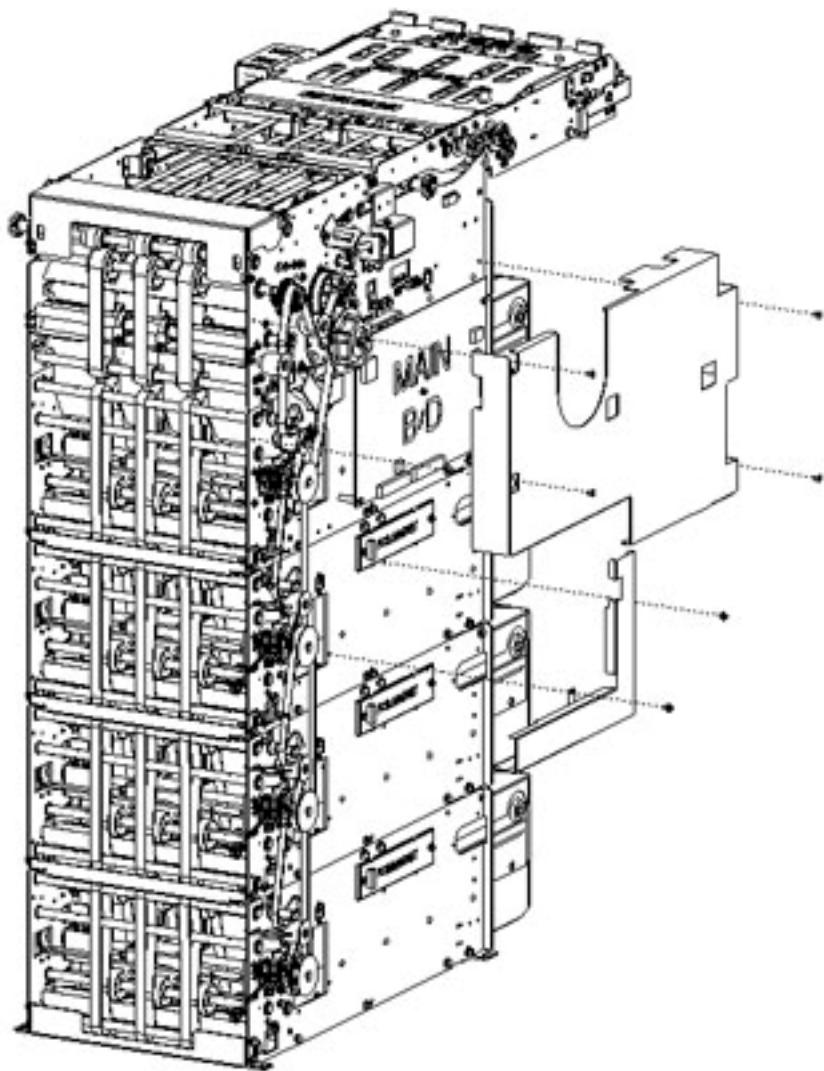


Fig. 6.23 Removal of Controller Protective Cover

#### 6.6.2.1 Transport path Sensor

##### 1) CS11D(A,B), CS21D(A,B), CS31D(A,B), CS41D(A,B)

- ① Remove two M4 screws at both sides on the Sensor Bracket Assembly as shown in the figure below.
- ② For easy disassembly, cut a couple of connected cable ties around there.
- ③ Disconnect the connector and remove the cable tie to remove the Sensor Bracket Assembly. Be careful not to break the connector pin when removing.
- ④ Remove the Sensor Bracket Assembly.
- ⑤ From the removed Sensor Bracket Assembly, remove the M3 screws (1 place each) of the sensor which will be replaced.
- ⑥ Replace the sensor.
- ⑦ Assemble the unit in the reverse order of ⑤ ~ ①

Note) When assembling the Sensor Bracket Assembly, ensure to completely lift Sensor Bracket Assembly up to have identical position between the face of sensor and transport path, and then tighten the two bracket screws.

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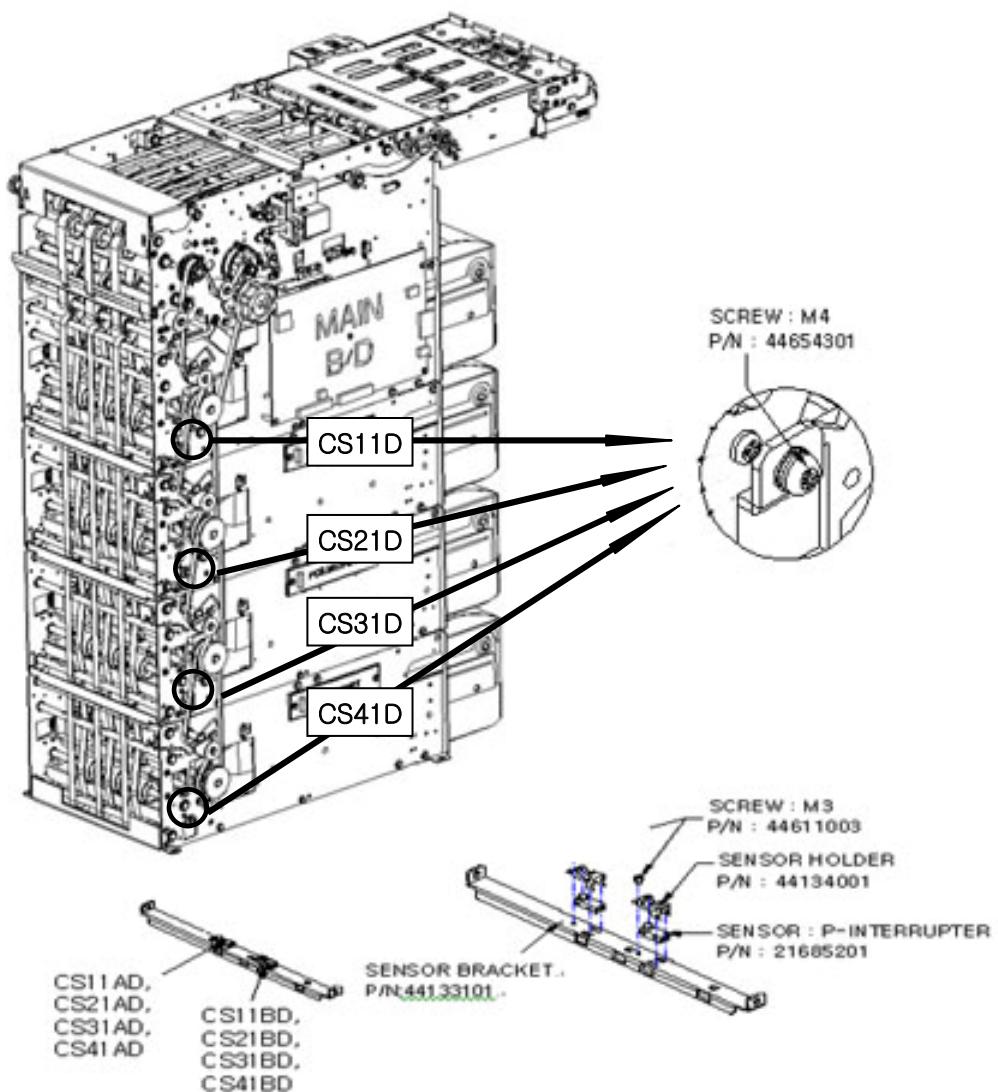


Fig. 6.24 Transport Path Sensor #1

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**2) CS11T(A,B), CS21T(A,B), CS31T(A,B), CS41T(A,B)**

- ① First, remove the Bill Empty Detection assembly at Bill Empty Detection Sensor in page 6-57.
- ② For easy disassembly, cut a couple of connected cable ties around there.
- ③ Remove three M4 screws at both sides as shown in the figure below.
- ④ Remove a couple of connectors and cables to remove the Sensor Bracket Assembly. Be careful not to break the connector pin when removing.
- ⑤ Remove the Sensor Bracket Assembly.
- ⑥ From the removed Sensor Bracket Assembly, remove the M3 sensor screws (1 place each) of the sensor which will be replaced.
- ⑦ Replace the sensor and then assemble the unit in the reverse order - ⑥~①.

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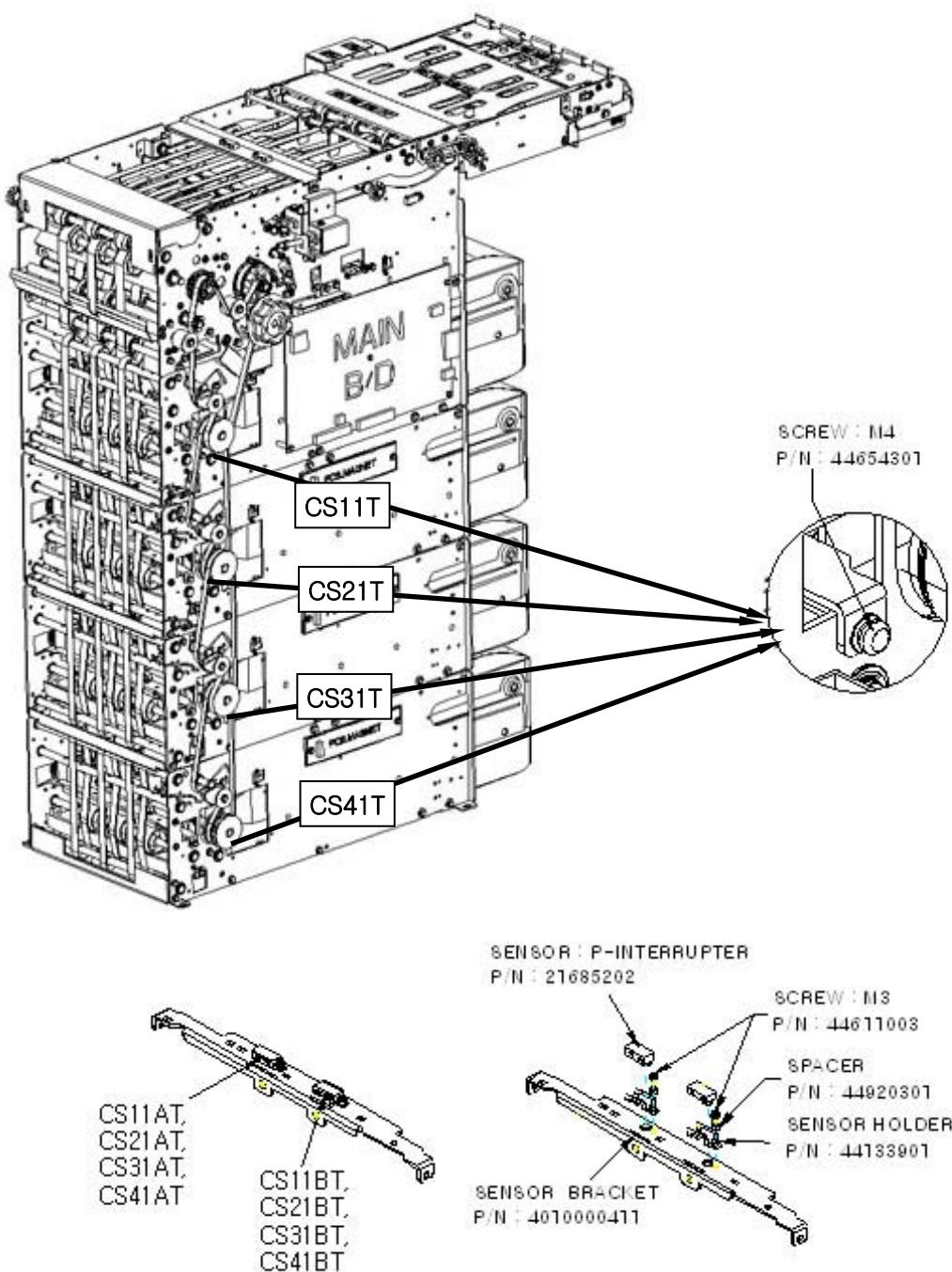


Fig. 6.25 Transport Path Sensor #2

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## 3) CS10T (A,B)

- ① Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ② Loosen the M3 sensor fixing screw (1 place) of the sensor to replace from the removed Sensor Bracket.
- ③ Replace the sensor.
- ④ Assemble the unit in the reverse order of ②~①.

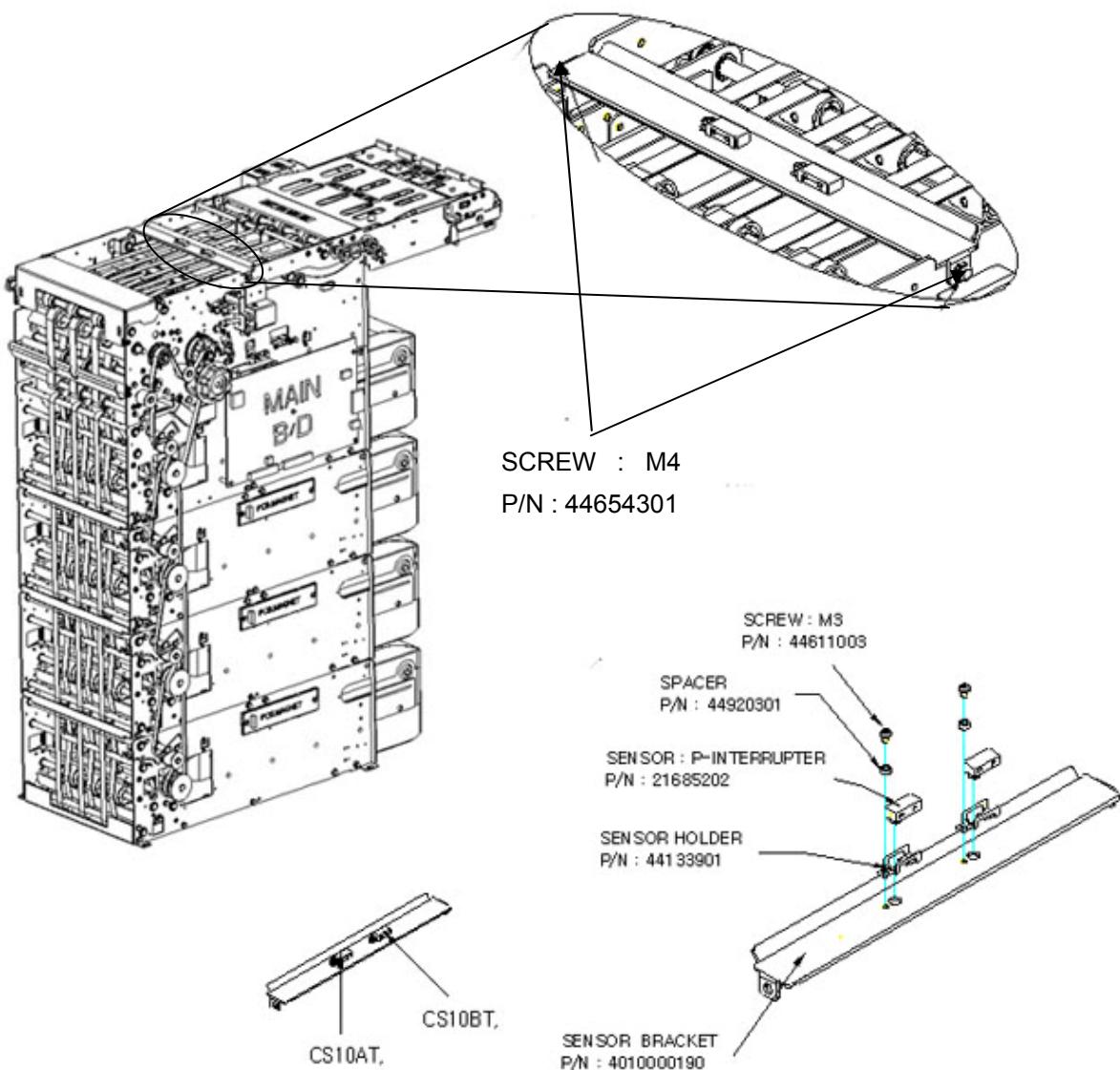


Fig. 6.26 Transport Path Sensor #3

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## 6. Cash Dispensing Unit

## 4) CS10D (A,B)

- ① First, revolve the Cam to place the temporary stacker to the upper direction.
- ② Loosen the sensor support M4 fixing screw (1 place) as shown in the below figure.
- ③ Disconnect the connector and remove the cable tie to remove the Sensor Bracket Assembly. Be careful not to break the connector pin when removing.
- ④ Remove the Sensor Bracket Assembly.
- ⑤ Loosen the M3 sensor fixing screw (1 place) of the sensor to replace from the removed Sensor Bracket Assembly.
- ⑥ Replace the sensor.
- ⑦ Assemble the unit in the reverse order of ⑤~①. When assembling the Sensor Bracket Assembly, align the rectangular to the body groove and tighten the M4 fixing screw (1 place).

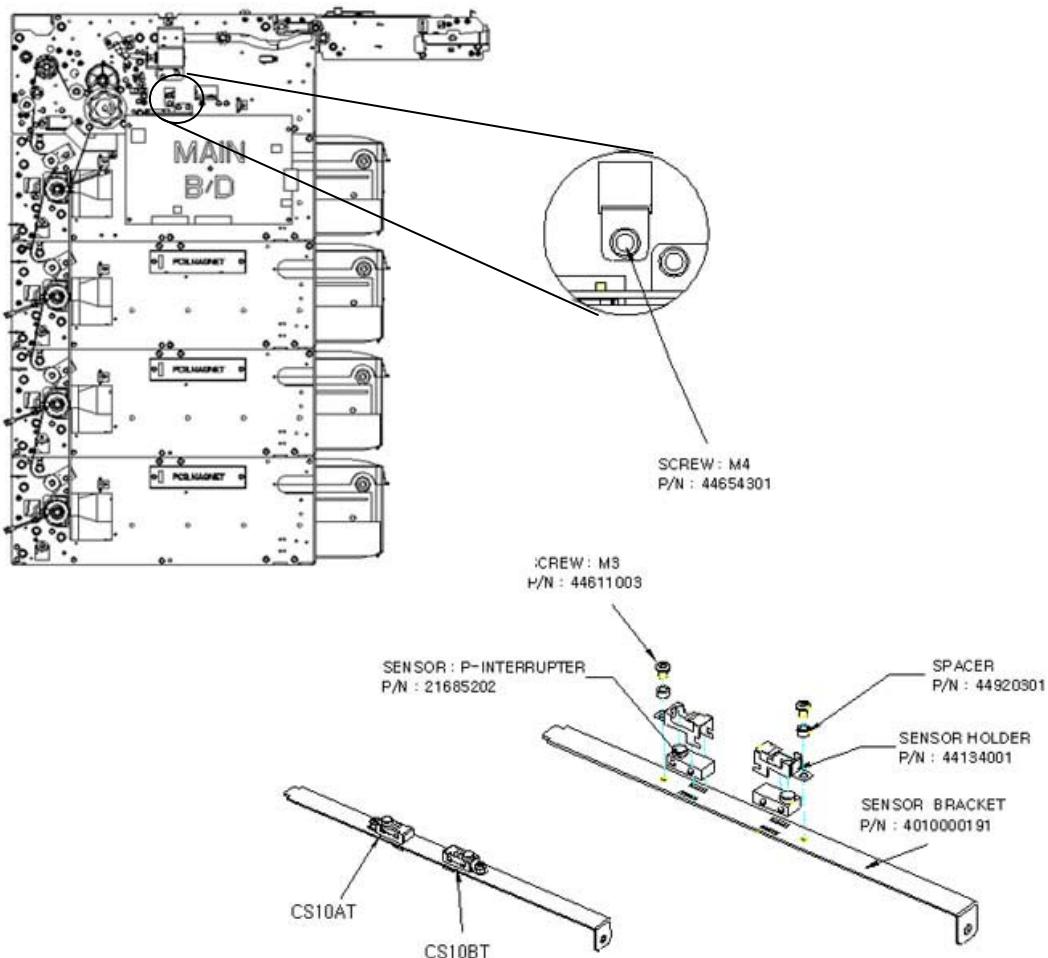


Fig. 6.27 Transport Path Sensor #4

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## 6. Cash Dispensing Unit

## 5) CS13T

- ① Loosen the sensor support M4 fixing screw (1 place) as shown in the below figure.
- ② Disconnect the connector and remove the cable tie to remove the Sensor Bracket Assembly. Be careful not to break the connector pin when removing.
- ③ Remove the Sensor Bracket Assembly.
- ④ Loosen the M3 sensor fixing screw (1 pace) of the sensor to replace from the removed Sensor Bracket Assembly.
- ⑤ Replace the sensor.
- ⑥ Assemble the unit in the reverse order of ④~①. When assembling the Sensor Bracket Assembly, align the rectangular to the body groove and tighten the M4 fixing screw (1 place).

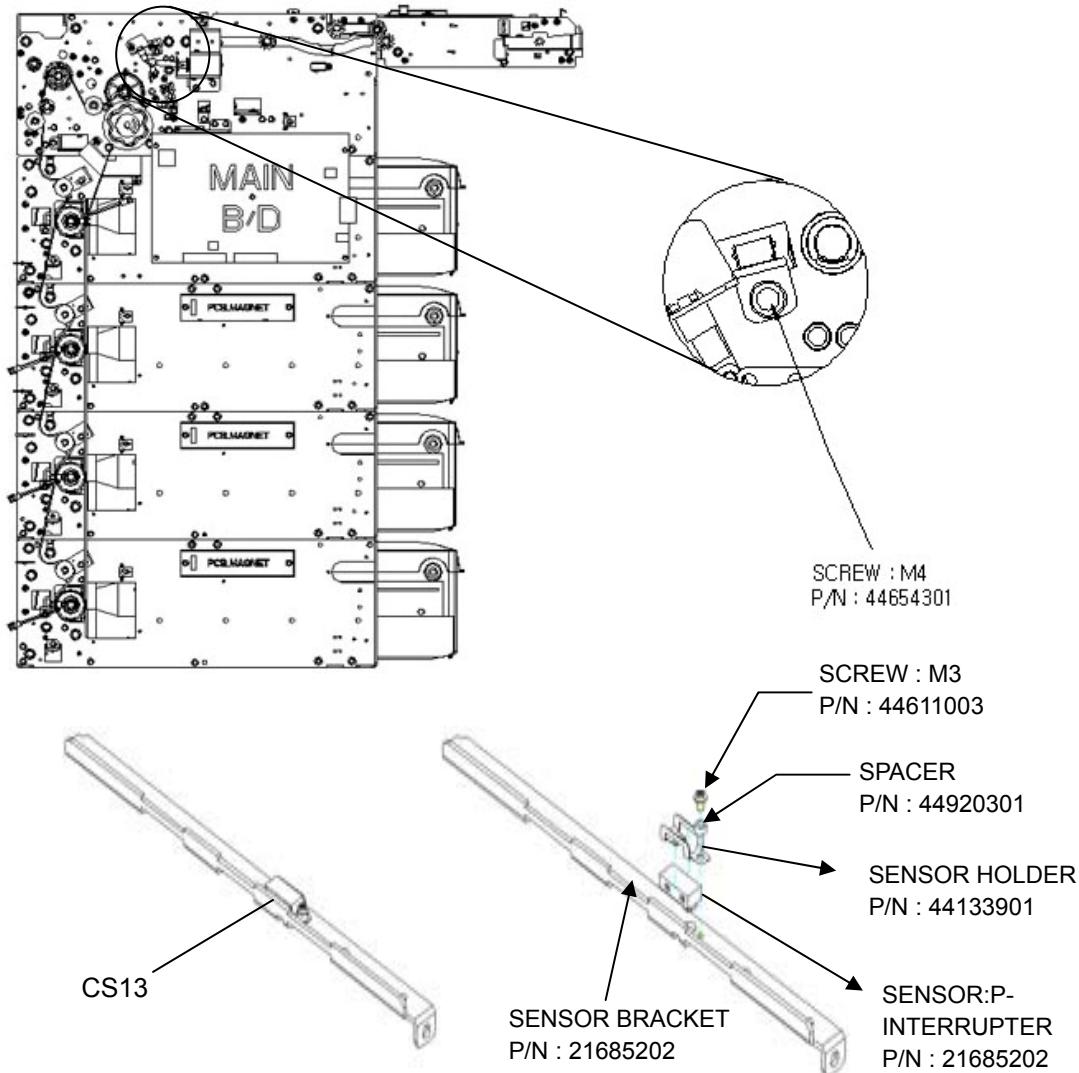


Fig. 6.28 Transport Path Sensor #5

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## 6) CS13D

- ① Loosen the sensor support M4 fixing screw (1 place) as shown in the below figure.
- ② Disconnect the connector and remove the cable tie to remove the Sensor Bracket Assembly. Be careful not to break the connector pin when removing.
- ③ Remove the Sensor Bracket Assembly.
- ④ Loosen the M3 sensor fixing screw (1 pace) of the sensor to replace from the removed Sensor Bracket Assembly.
- ⑤ Replace the sensor.
- ⑥ Assemble the unit in the reverse order of ④~①. When assembling the Sensor Bracket Assembly, align the rectangular to the body groove and tighten the M4 fixing screw (1 place).

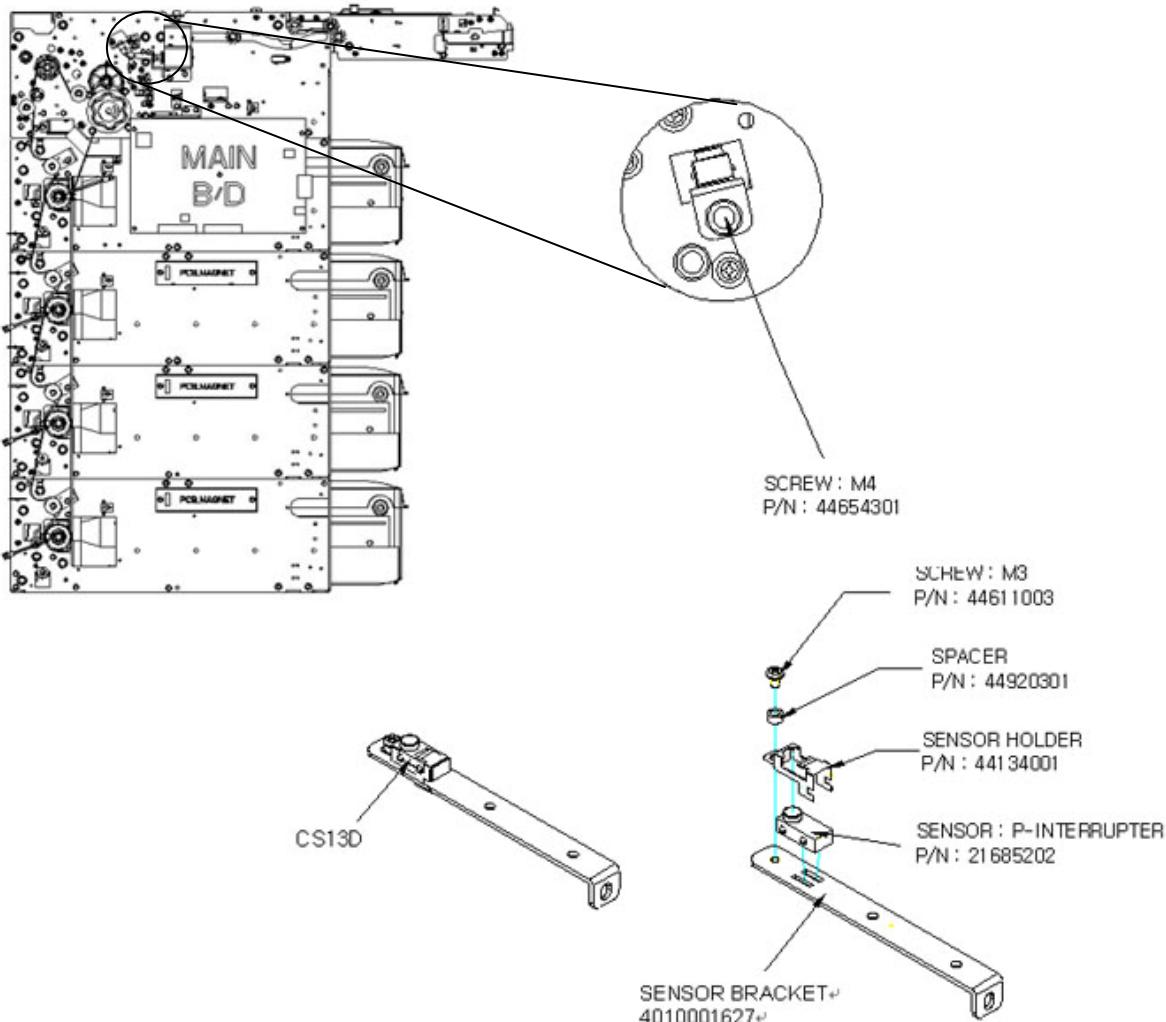


Fig. 6.29 Transport Path Sensor #6

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## 6. Cash Dispensing Unit

## 7) CS4D,T

- ① Disconnect the connector and remove the cable tie to remove the sensor supporter. Be careful not to break the connector pin when removing.
- ② Loosen the M3 sensor fixing screw (1 place each) to replace from the fixed Sensor Bracket .
- ③ Replace the sensor.
- ④ Assemble the unit in the order of ②~①.

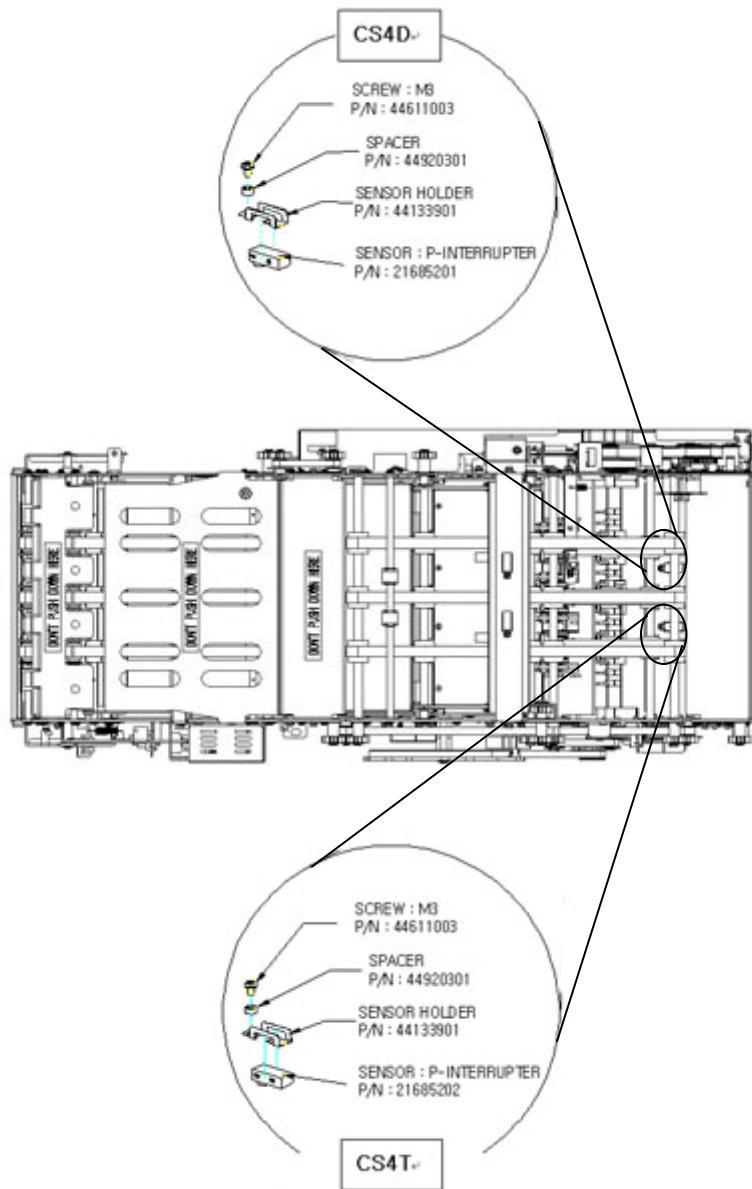


Fig. 6.30 Transport Path Sensor #7

**MoniMax 5600****6. Cash Dispensing Unit****8) CS14D**

- ① Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ② Loosen the M3 sensor fixing screw (1 pace) of the sensor to replace from the removed Sensor Bracket
- ③ Replace the sensor.
- ④ Assemble the unit in the reverse order of ②~①.

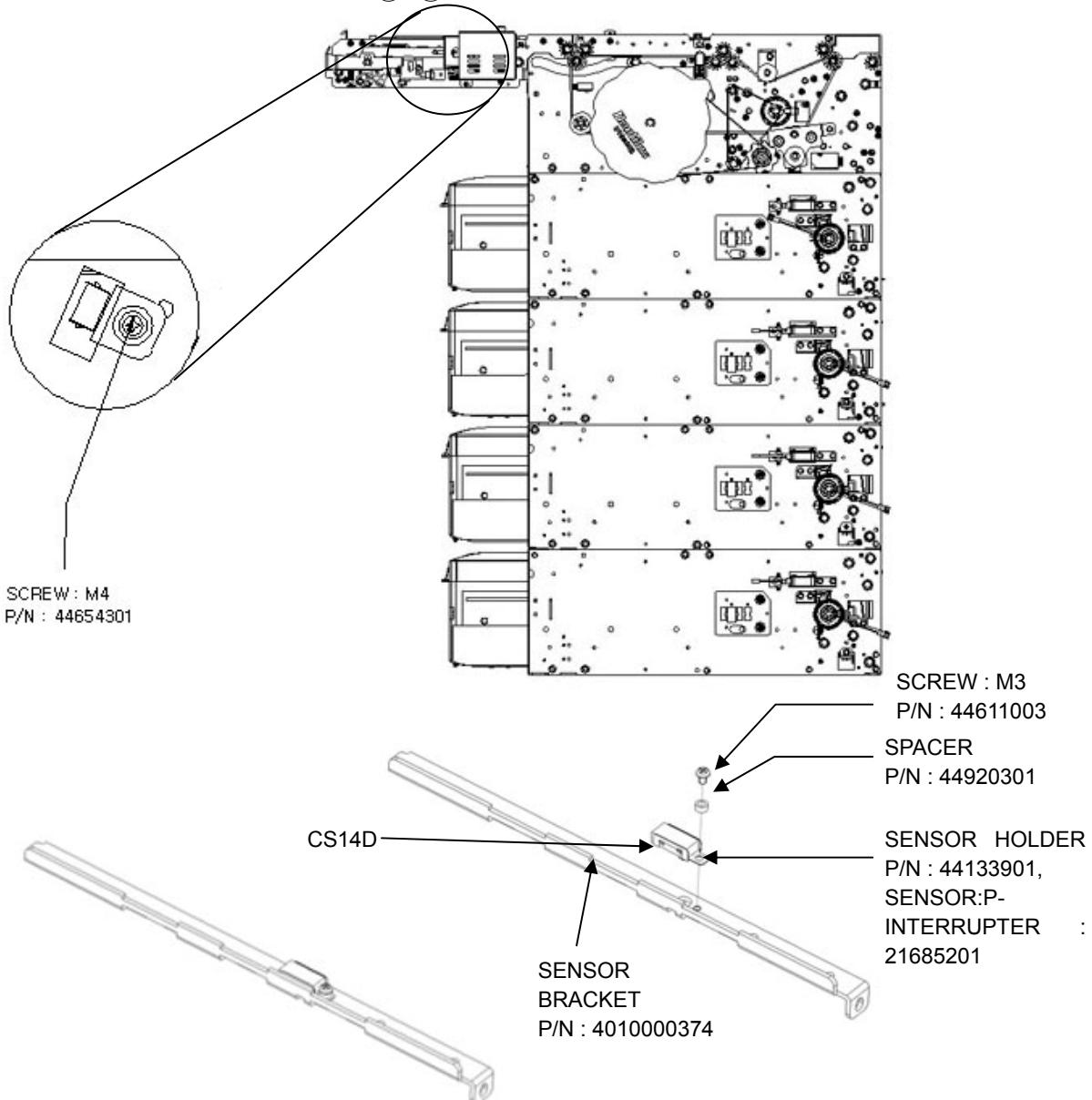


Fig. 6.31 Transport Path Sensor #8

**MoniMax 5600****6. Cash Dispensing Unit****9) CS14T**

- ① Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ② Loosen the M3 sensor fixing screw (1 pace) of the sensor to replace from the removed Sensor Bracket
- ③ Replace the sensor.
- ④ Assemble the unit in the reverse order of ②~①.

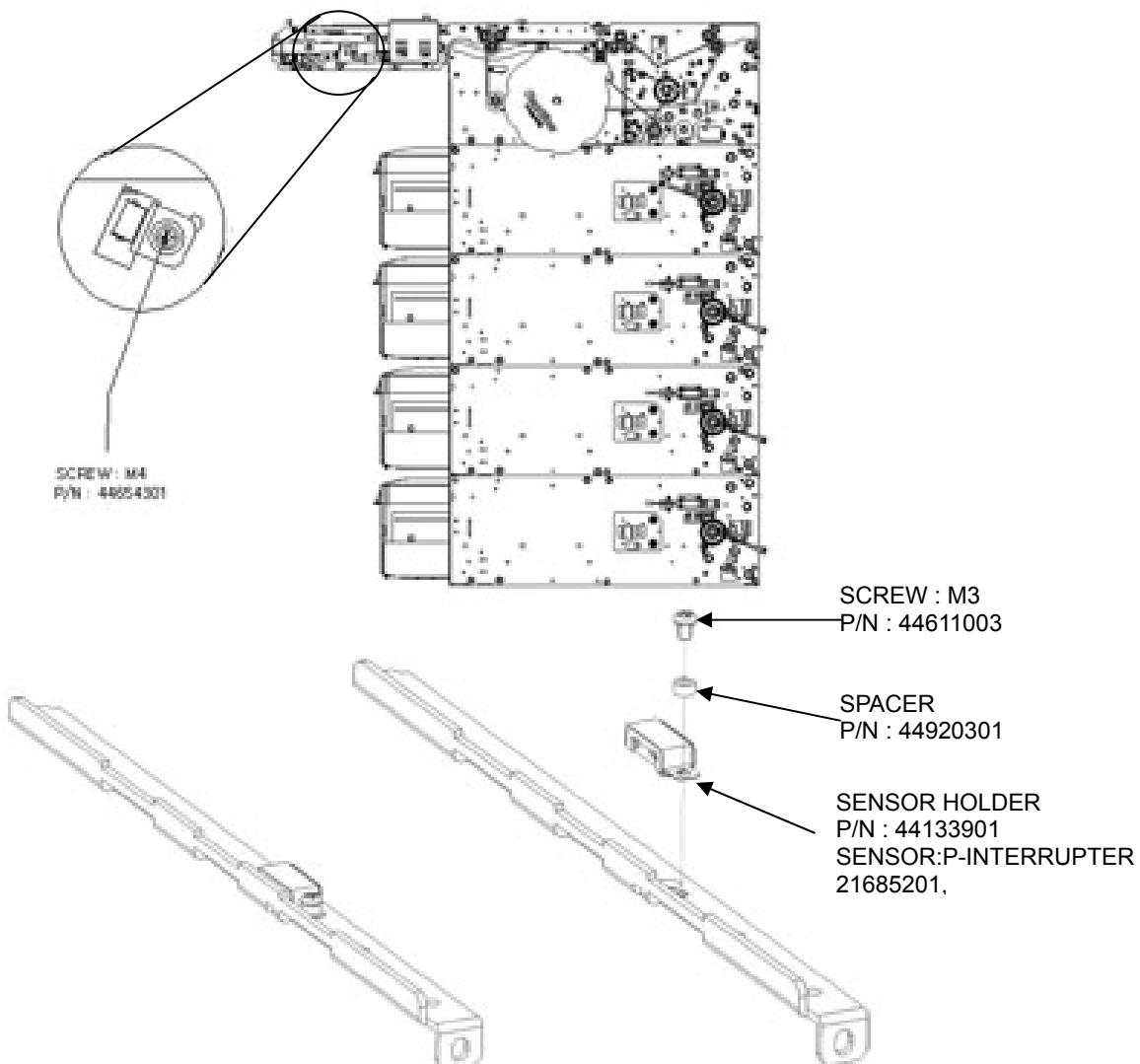


Fig. 6.32 Transport Path Sensor #9

### 6.6.2.2 Gate Operation Detection Sensor & Encoder Sensor

#### 1) CS3

- ① Loosen the M3 fixing screw of the CS3 Sensor Bracket (1 place).
- ② Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ③ Remove the black rubber which attached to back of the Sensor Bracket.
- ④ Press the part 'B' of the sensor softly as shown in the below figure to remove the lock and the sensor.
- ⑤ To insert the sensor, insert the part 'A' first and press the part 'B' to lock.
- ⑥ Assemble in the order of ④~①.
- ⑦ Before tightening screw of CS3 sensor completely, first release the flanger of the solenoid and make sure to adjust the detection bracket to the center of the sensor. After checking that, tighten screw completely.

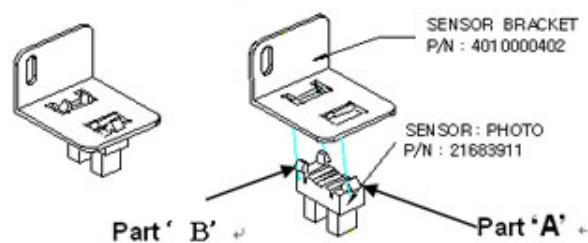
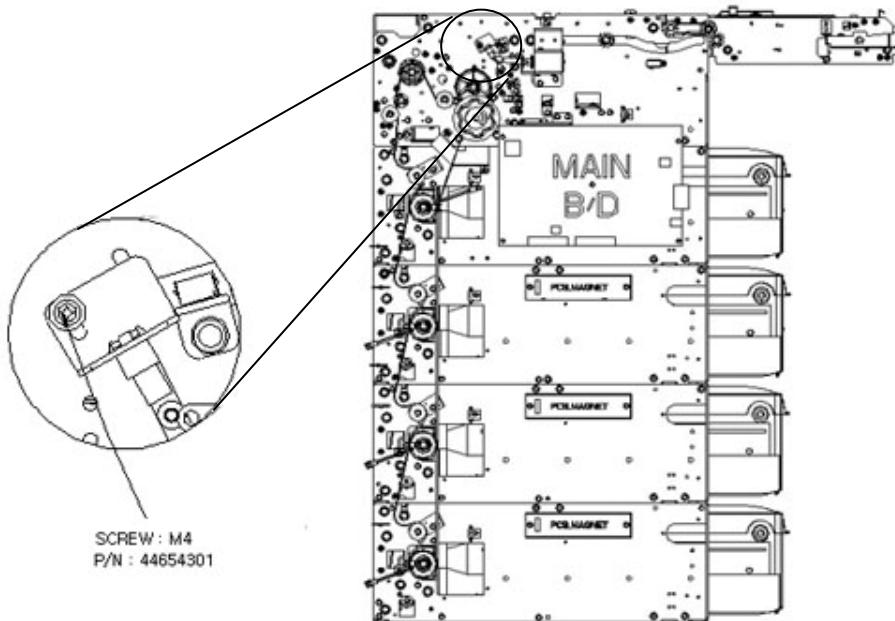


Fig. 6.33 Gate Sensor

**2) CS8 (Main motor encoder sensor)**

- ① Loosen the M4 fixing screw of the CS8 Sensor Bracket (1 place).
- ② Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ③ Press the part 'B' of the sensor softly as shown in the below figure to remove the lock and the sensor.
- ④ To insert the sensor, insert the part 'A' first and press the part 'B' to lock.
- ⑤ Assemble this in the order of ③~①.

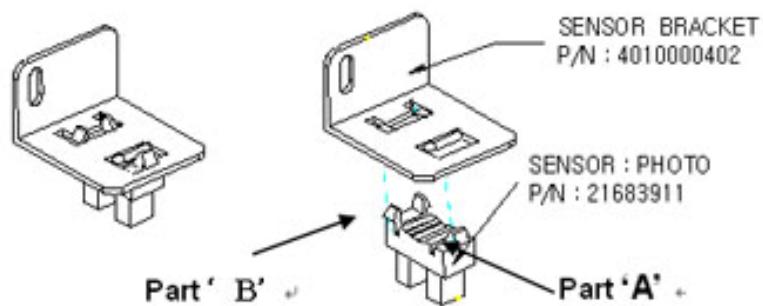
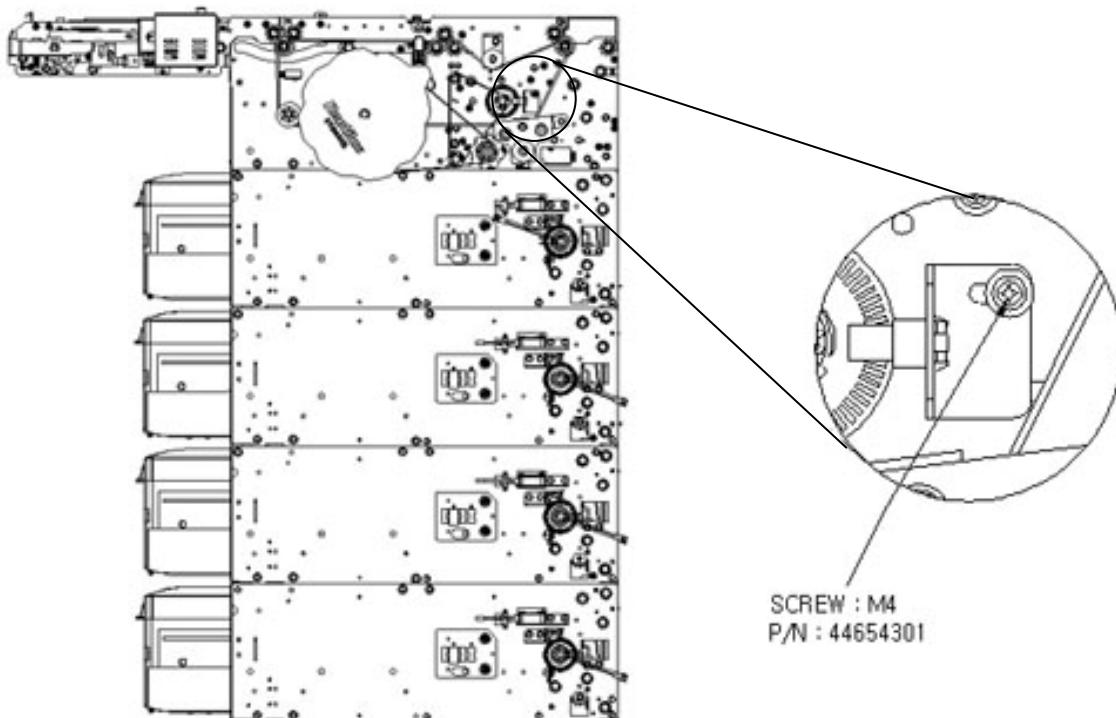


Fig. 6.34 Encoder Sensor #01

## MoniMax 5600

## 6. Cash Dispensing Unit

**3) CS19, CS29, CS39, CS49 (Clutch encoder sensor)**

- ① Loosen the M4 fixing screw of the CS8 Sensor Bracket (2 places).
- ② Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ③ Press the part ② of the sensor softly as shown in the below figure to remove the lock and the sensor.
- ④ To insert the sensor, insert the part ① first and press the part ② to lock.
- ⑤ Assemble this in the order of ③~①.

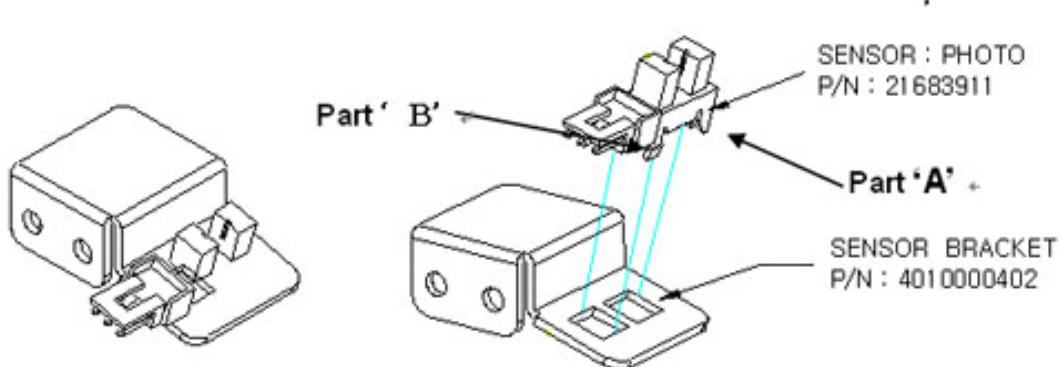
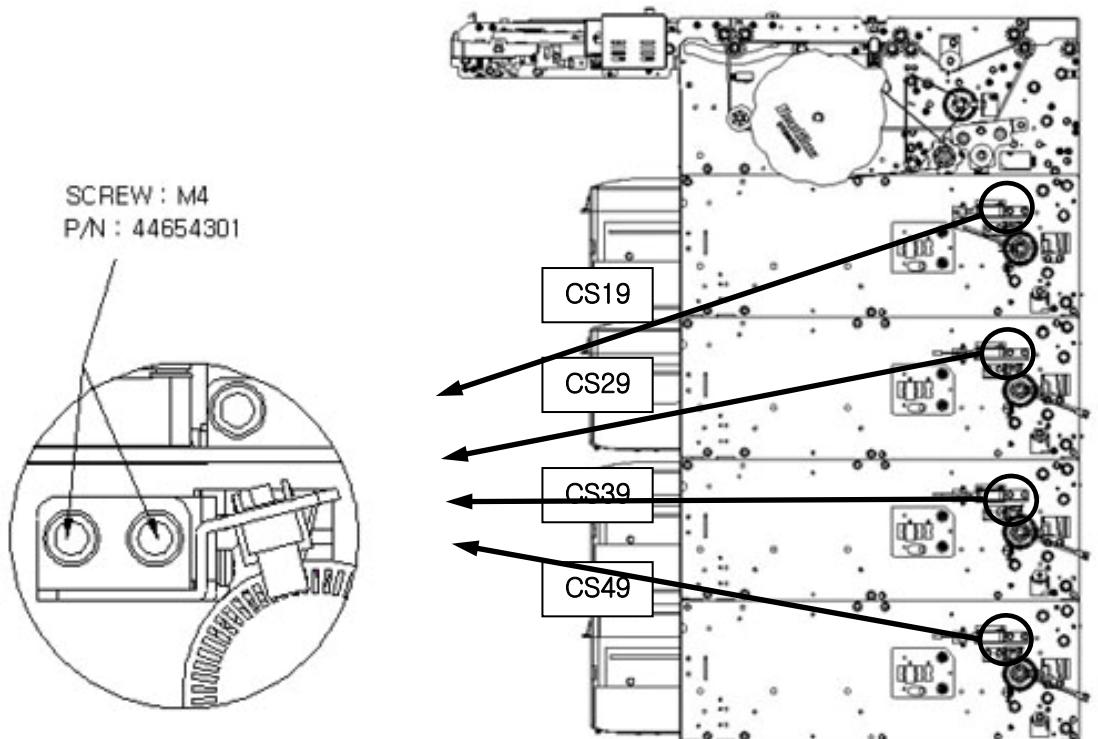


Fig. 6.35 Encoder Sensor #02

**MoniMax 5600**

**6. Cash Dispensing Unit**

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**6.6.2.3 Docking Sensor**

**1) CS17, CS27, CS37, CS47 (Cassette Position Sensor)**

- ① Loosen the Sensor Bracket M4 fixing screw (2 places).
- ② Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ③ Remove the Sensor Bracket.
- ④ Loosen the M3 sensor fixing screw (2 places) from the remove Sensor Bracket.
- ⑤ Replace the sensor.
- ⑥ Assemble in the order of ④~①.

Note) Adjust cassette position when mounting it so that you can hear click sound from the switch.

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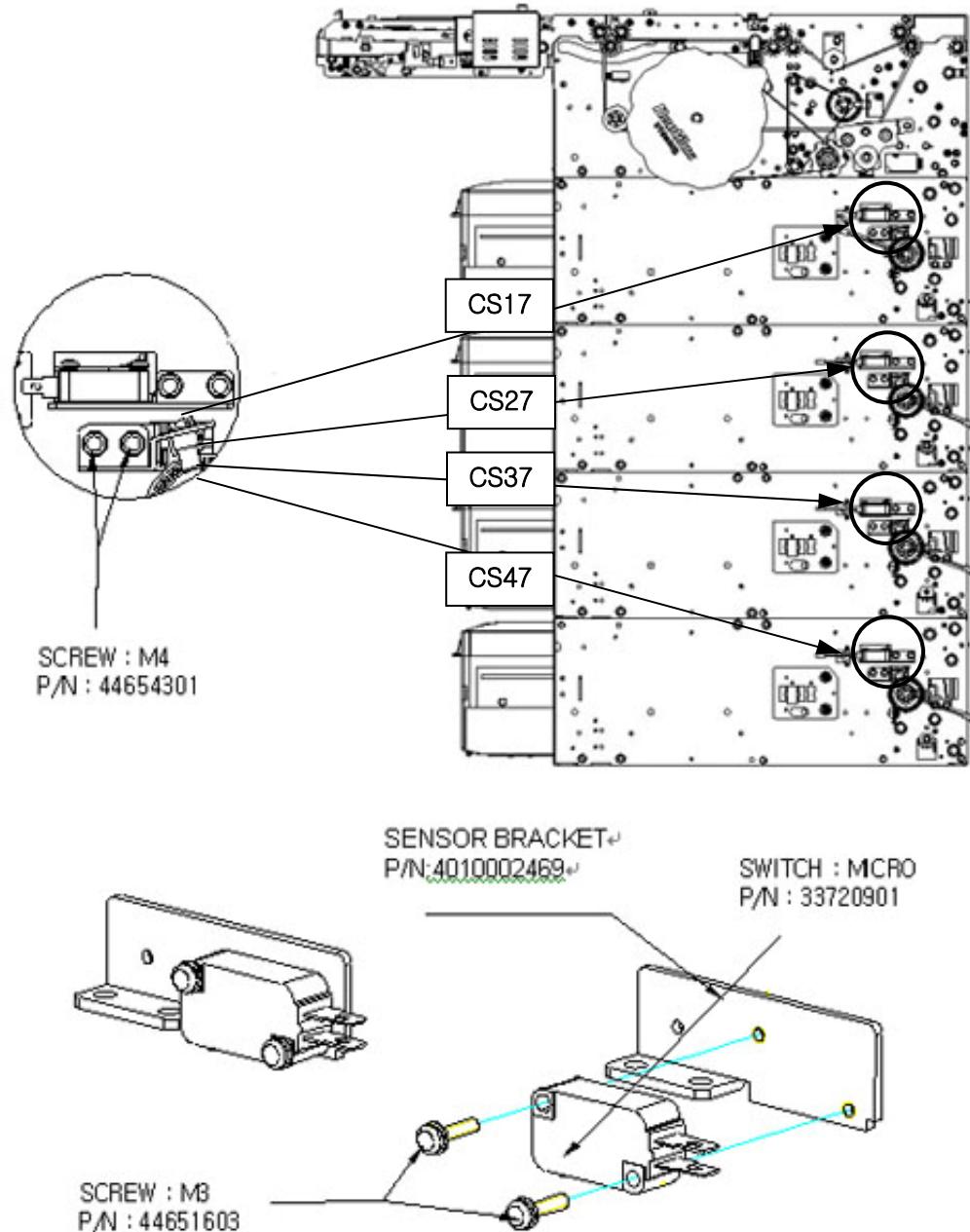


Fig. 6.36 Cassette Docking Sensor #01

**MoniMax 5600**

**6. Cash Dispensing Unit**

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**2) CS2 (Reject/retract Box Docking Sensor)**

- ① Remove the Electronic Control Board assembly (\*Refer to 1) Electronic Board assembly in page 6-85)
- ② Loosen the M3 fixing screw (2 places) of Sensor Bracket.
- ③ Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ④ Loosen the M3 sensor fixing screw (2 places) from the removed sensor supporter.
- ⑤ Replace the sensor and then assemble in the reverse order of ③~①.

Note) Adjust cassette position when mounting it so that you can hear click sound from the switch.

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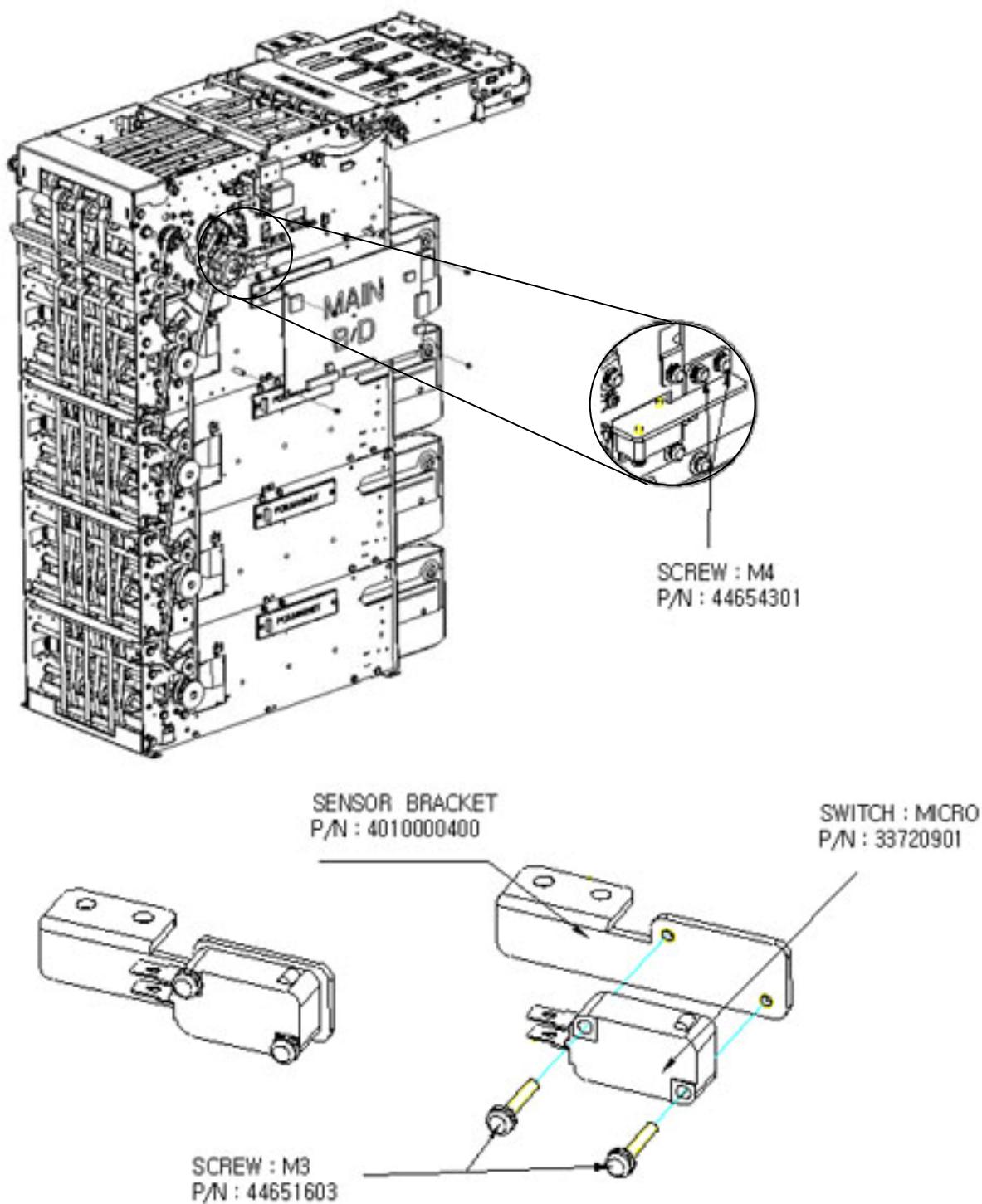


Fig. 6.37 Reject/R retract docking Sensor #02

**6.6.2.4 Retract Box Full Sensor****1) CS9D**

- ① Loosen the M3 fixing screw (1 place) of the Sensor Bracket.
- ② Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ③ Remove the sensor and replace this one.
- ④ Assemble in the order of ②~①.

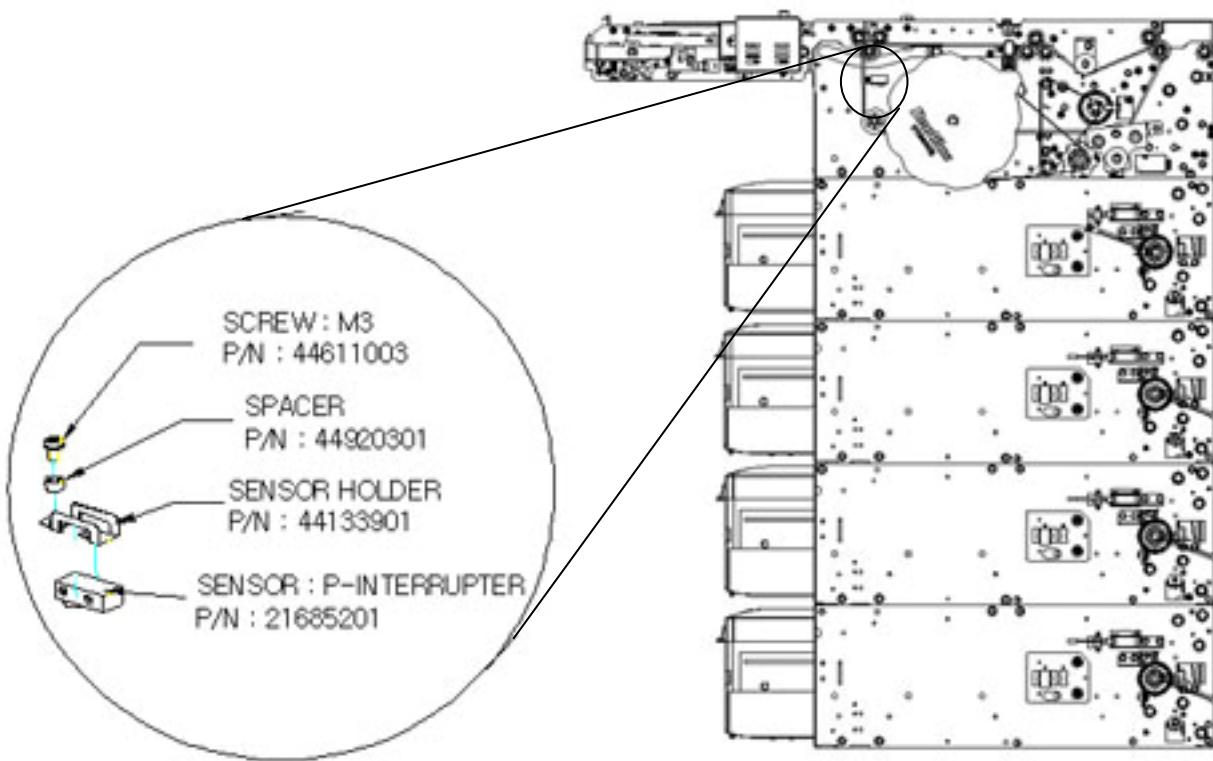


Fig. 6.38 Retract Box Full Sensor #01

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2) CS9T

- ① Loosen the M3 fixing screw (1 place) of the Sensor Bracket.
- ② Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ③ Remove the sensor and replace this one.
- ④ Assemble in the order of ②~①.

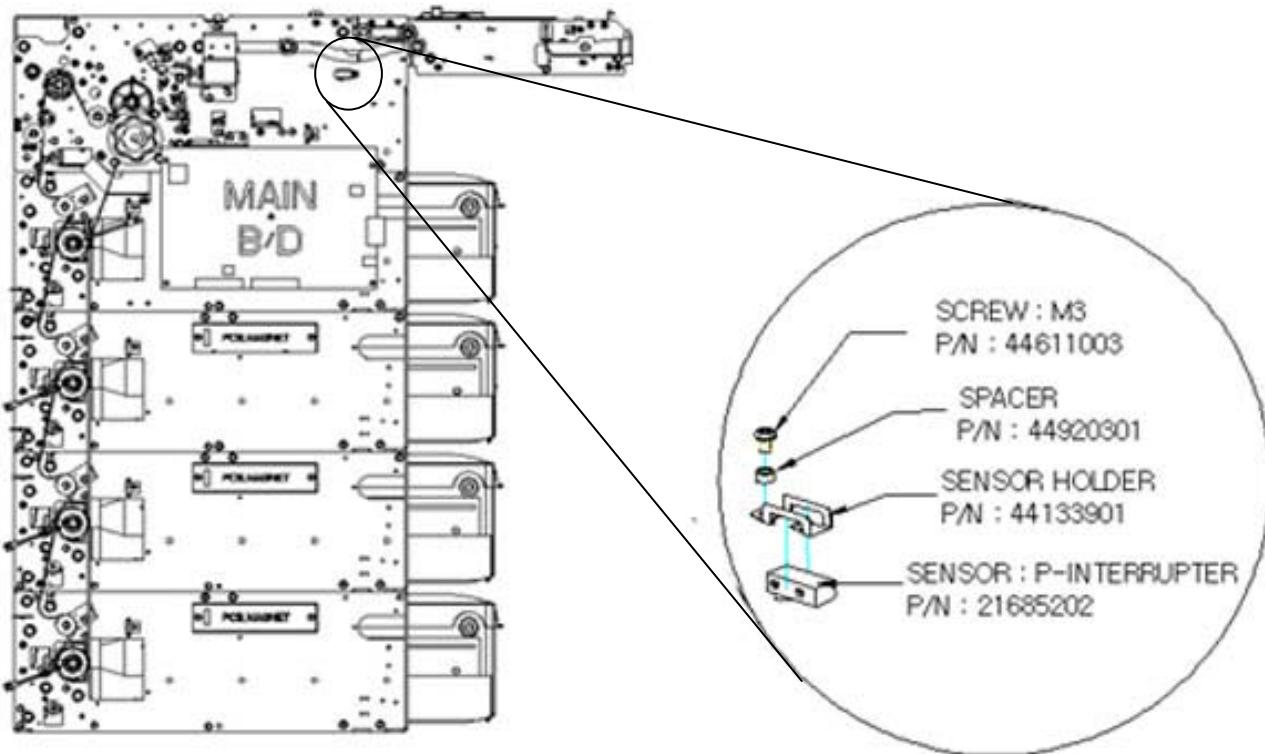


Fig. 6.39 Retract Box Full Sensor #02

### 6.6.2.5 Cash Low Sensor

#### 1) CS16, CS26, CS36, CS46

- ① Loosen the Sensor Bracket M3 fixing screw (2 places).
- ② Press the snap lock from the rear side of the Sensor Bracket with hands to remove. Then, remove the sensor.

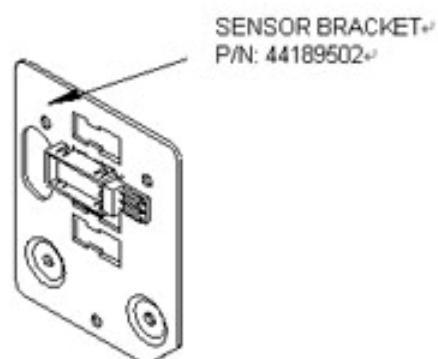
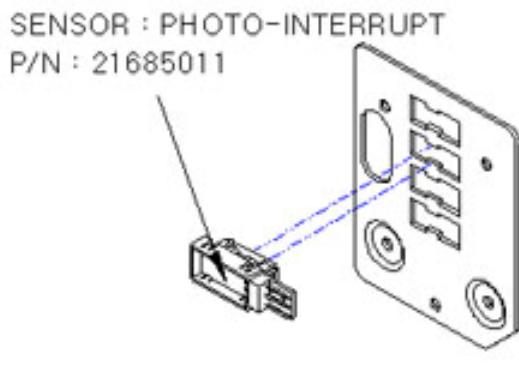
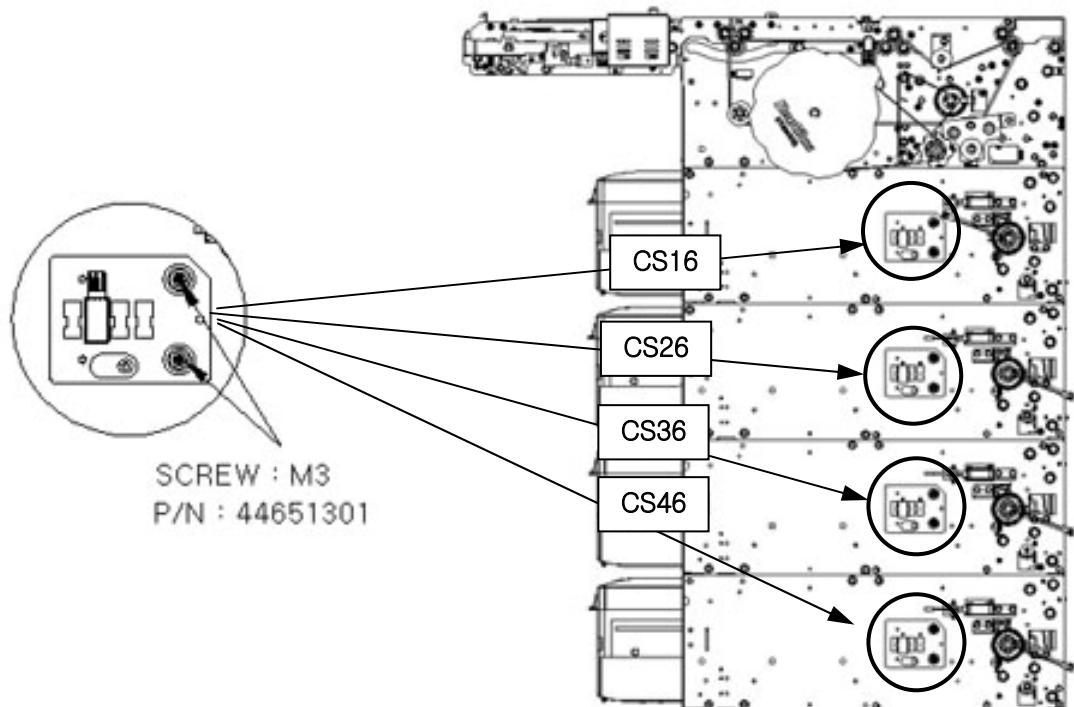


Fig. 6.40 Cash Low Sensor

## MoniMax 5600

## 6. Cash Dispensing Unit

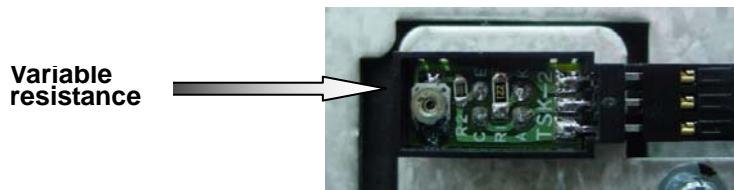
③ Disconnect the connector. Be careful not to break the connector pin when removing

④ Replace the sensor.

⑤ Connect the connector.

⑥ To assemble the sensor in the bracket, lock it from the front side and press the rear side to fix it.

Note) Adjust the sensor by running the variable resistance so that it generate below 1.0V if remaining amount is available. Otherwise, set it above 3.0V.



### 6.6.2.6 Bill Withdrawal Detection Sensor (CS15)

- ① Loosen M3 fixing screw (1 place) of the Sensor Bracket.
- ② Disconnect the connector and remove the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ③ Remove the black rubber which attached to back of the Sensor Bracket.
- ④ Press the part 'B' of the sensor softly as shown in the figure below to remove the lock and the sensor.
- ⑤ Replace the sensor.
- ⑥ Assemble this in the order of ④~①. To insert the sensor, insert the part 'A' first and press the part to lock.

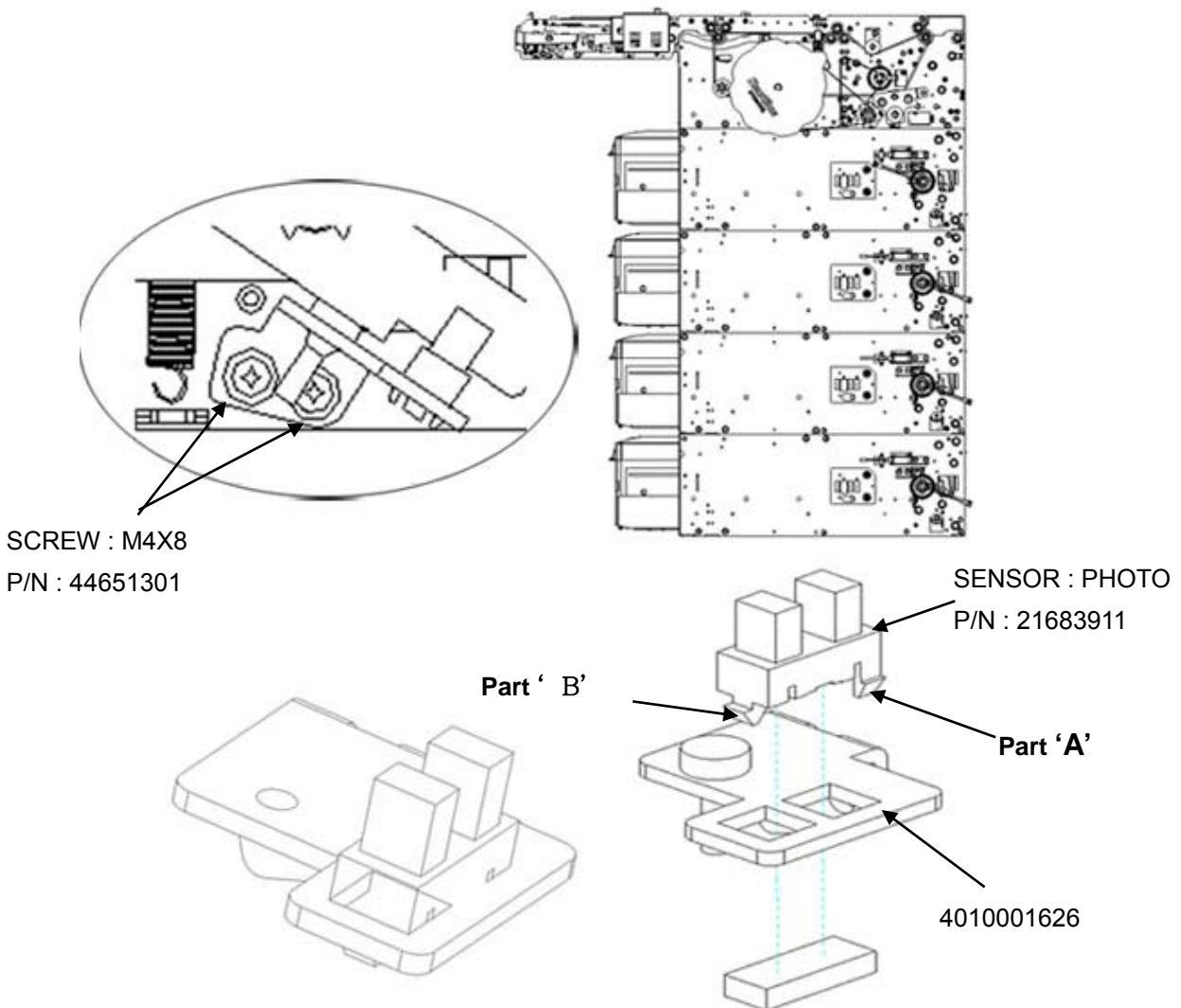


Fig. 6.41 Bill Withdrawal Detection Sensor

#### 6.6.2.7 Cam detection Sensor (CS6, CS7)

- ① Remove E-ring and Cam Bracket. Then Loosen the M4 fixing screw of Sensor Bracket (each 1 place).
- ② Remove the black rubber which attached to back of the Sensor Bracket.
- ③ Remove the connector and the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ④ Press the part 'B' of the sensor softly as shown in the below figure to remove the lock and the sensor.
- ⑤ To insert the sensor, insert the part 'A' first and press the part 'B' to lock.
- ⑥ Assemble in the order of ④~①

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6. Cash Dispensing Unit

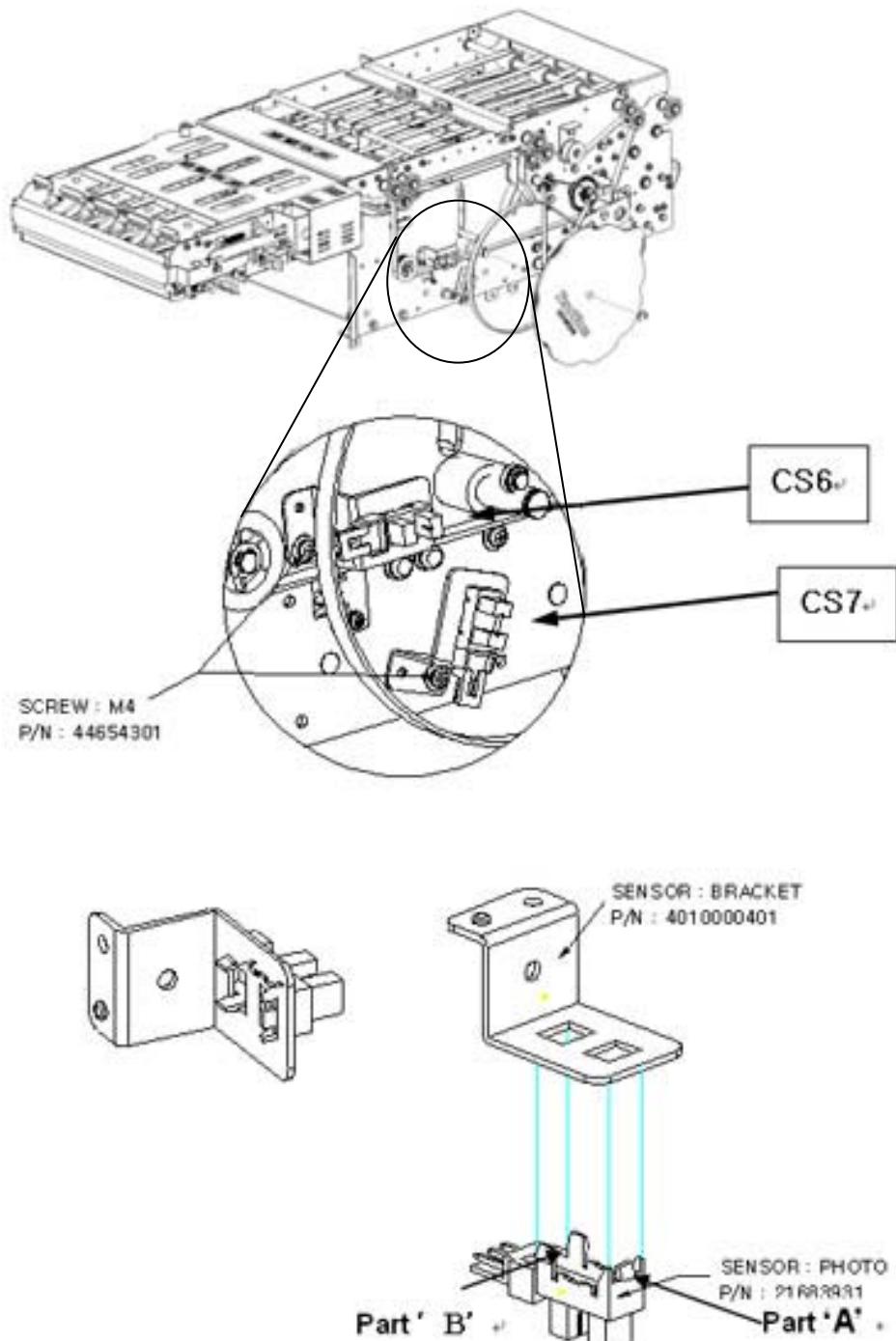


Fig. 6.42 Cam detection Sensor

**MoniMax 5600****6. Cash Dispensing Unit****6.6.2.8 Bill Empty Detection Sensor (CS18D,T CS 28D,T CS38D,T CS48D,T)**

- ① Loosen M3 fixing screw (each 2 places) of the Sensor Bracket.
- ② Disconnect two connectors and take out cables from each cable tie to remove Sensor Bracket. Be careful not to break the connector pin when removing.
- ③ Loosen M3 fixing screw (each 2 places) on the sensor to take out the sensor
- ④ Replace the sensor.
- ⑤ Assemble in the order of ③~①.

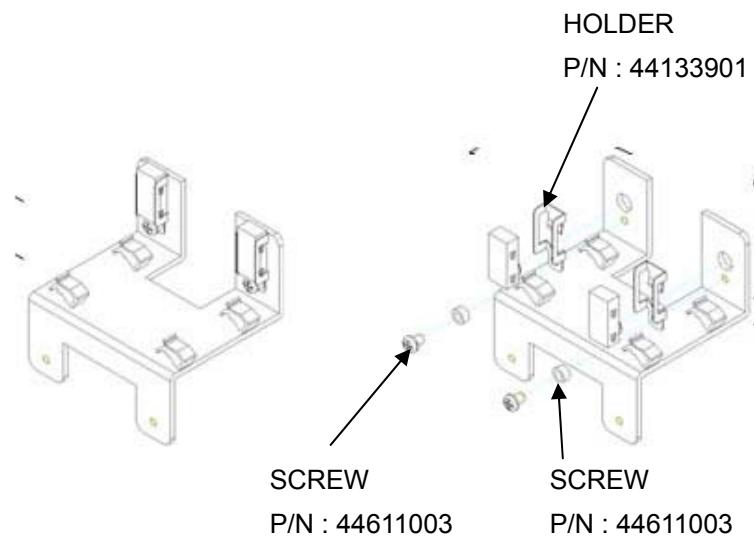
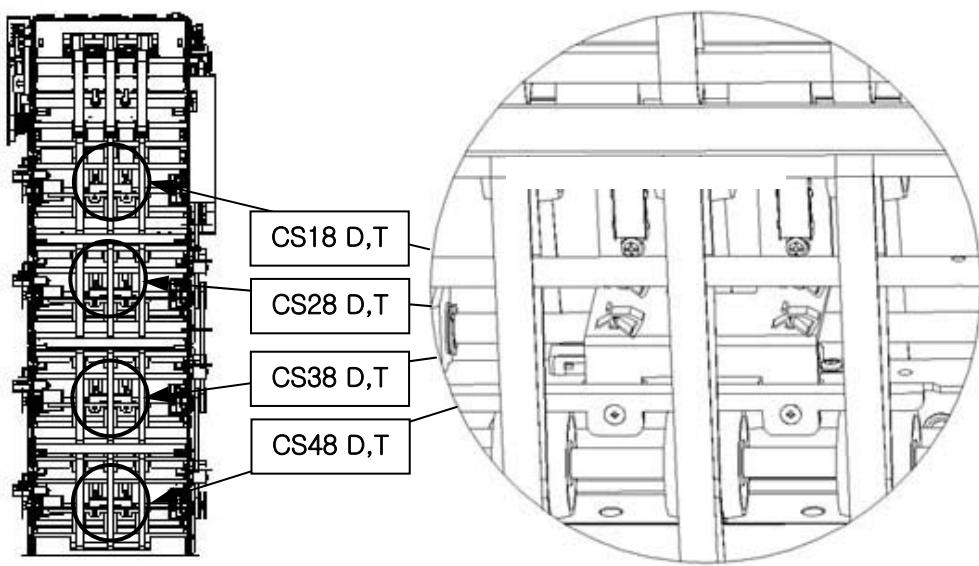


Fig. 6.43 Bill Empty Detection Sensor

### 6.6.2.9 Cassette Identification Sensor (CS12,CS22,CS32, CS42)

- ① In case of replacing the cassette identification sensor(CS12) on first feeding module, you should firstly remove the electronic control board. On other feeding modules, you can skip this step.
- ② In case of replacing the cassette identification sensor(CS22) on second feeding module, you should firstly remove the cable guide bracket. On other feeding modules, you can skip this step.
- ③ Loosen M3 fixing screw (each 2 places) of the Sensor Bracket.
- ④ Remove the connector and the cable tie to remove the Sensor Bracket. Be careful not to break the connector pin when removing.
- ⑤ Replace the sensor.
- ⑥ Assemble in the order of ④~①.

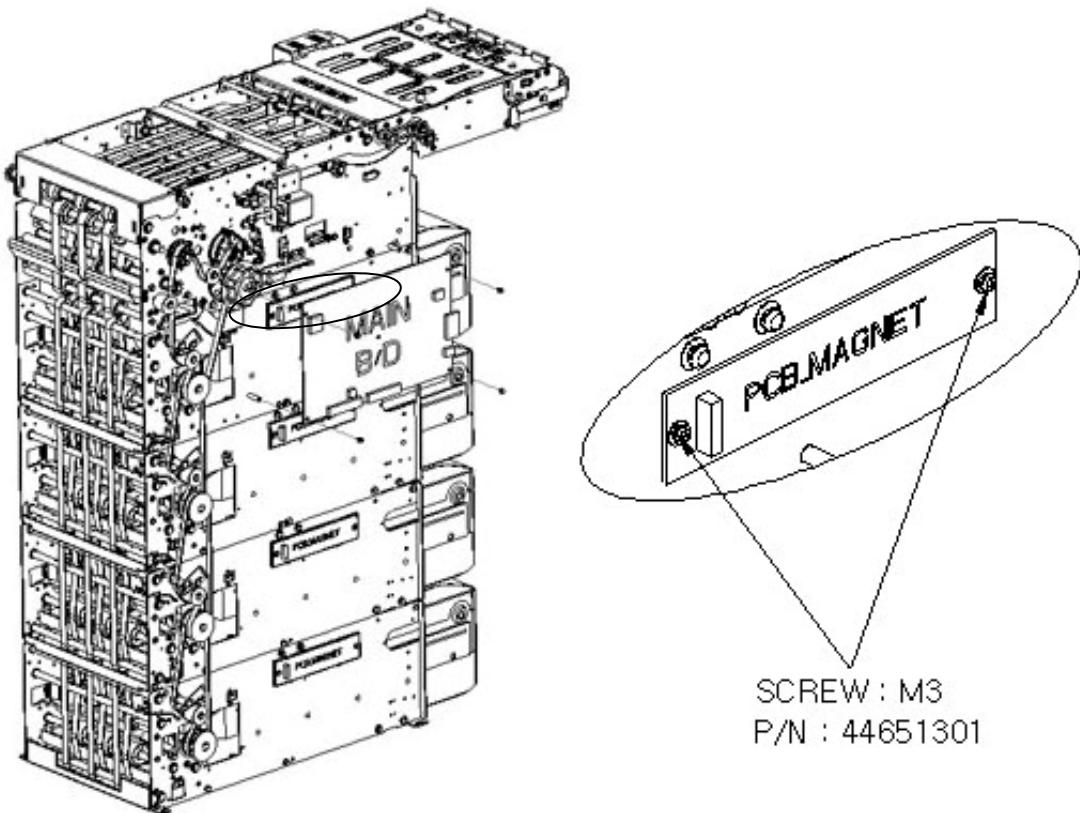


Fig. 6.44 Cassette Identification Sensor

### 6.6.3 Sub-assembly Replacement

#### 6.6.3.1 Controller Board assembly

- 1) The board assembly is composed of the main board and the sub board as shown in the following figure.
- 2) Remove the connector from the board. Be careful not to break the connector pin.
- 3) Loosen the board M3 fixing screws (5 places in the main board and 4 places in the sub board).
- 4) Replace the board.
- 5) Assemble in the order of 4)~ 1).

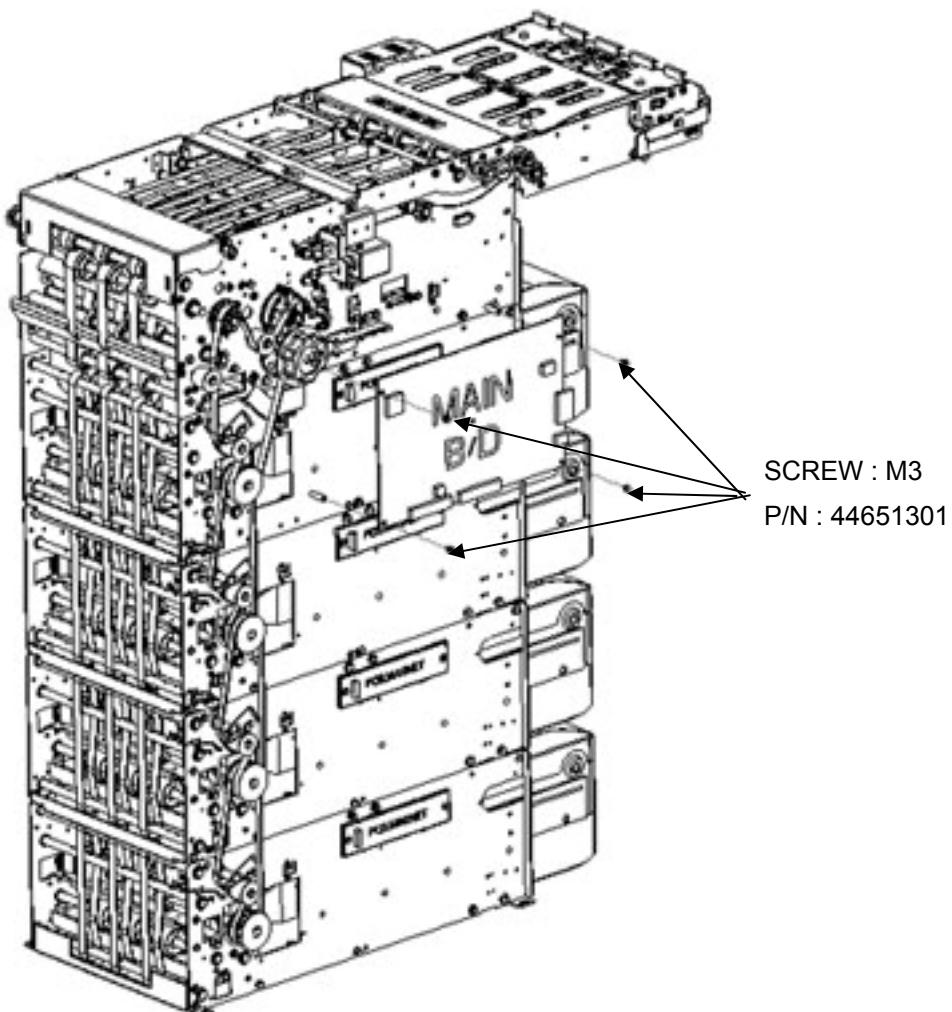


Fig. 6.45 Controller Board assembly

### 6.6.3.2 Main Motor Assembly

- 1) Take out one belt and electronic board connected a lot of cables
- 2) Loosen M4 fixing screw (6 places) to separate the main module from CDU body
- 3) Remove the power cable from the main motor.
- 4) Remove the knob and unscrew the M5 fixing screw (3 places) of the main motor.
- 5) Remove the main motor assembly and replace it.  
Assemble by the order of 4)~ 1).

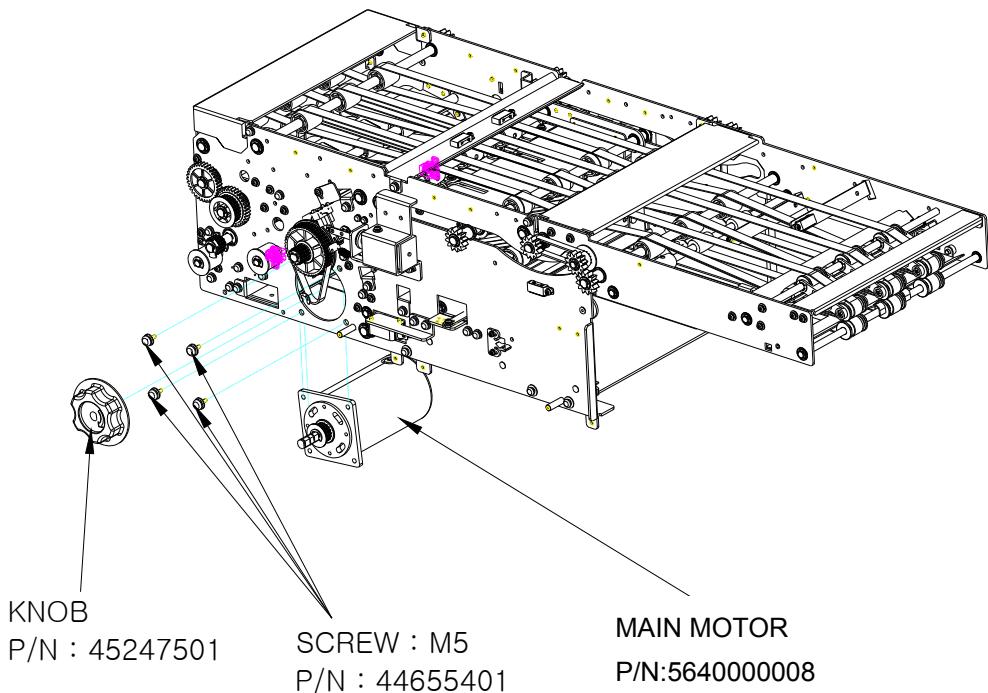


Fig. 6.46 Main Motor assembly

### 6.6.3.3 Delivery Motor Assembly

- 1) Remove the tension bracket and belt around the motor.
- 2) Loosen set screw (2 places) on pulley and take out the pulley.
- 3) Remove the connector and the cable tie to take out the motor. Be careful not to break the connector pin when removing
- 4) Loosen M3 fixing screw (6 places) on motor.
- 5) Remove the delivery motor assembly and replace it.
- 6) Assemble by the order of 4) ~ 1).

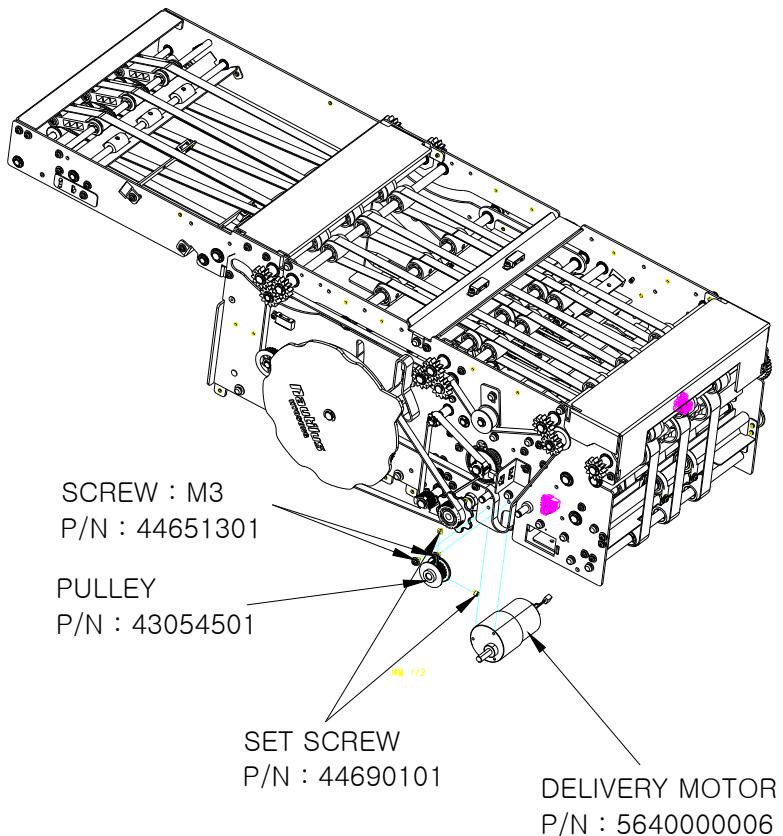


Fig. 6.47 Delivery Motor Assembly

#### 6.6.3.4 Cam Motor Assembly

- 1) Remove the cam bracket, E-ring and belt around the motor.
- 2) Loosen set screw (2 places) on pulley and take out the pulley
- 3) Remove the connector and the cable tie to take out the motor. Be careful not to break the connector pin when removing
- 4) Loosen M3 fixing screw (3 places) on motor.
- 5) Remove the cam motor assembly and replace it.
- 6) Assemble by the order of 4) ~ 1).

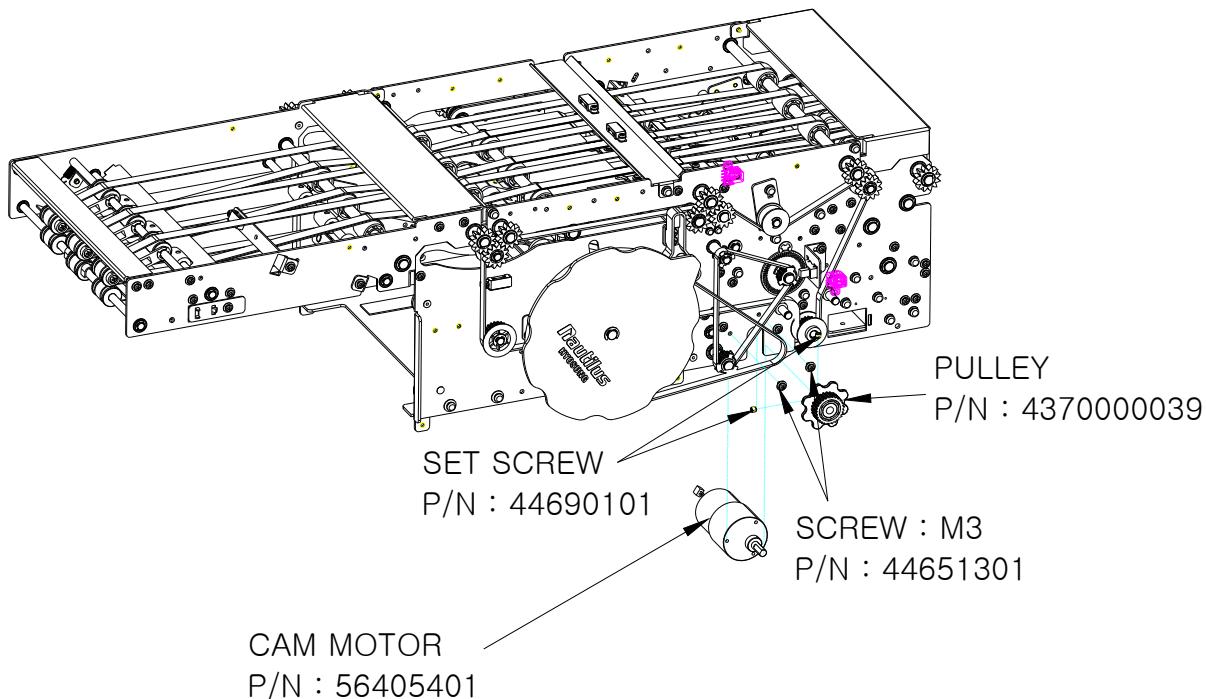


Fig.6.48 Cam Motor Assembly

### 6.6.3.5 Gate Solenoid Assembly

- 1) Remove the solenoid power cable.
- 2) Loosen the solenoid bracket M4 fixing screw (2 places).
- 3) Loosen the solenoid M3 fixing screw (3 places).
- 4) Remove the solenoid assembly and replace it.
- 5) Assemble in the order of (4)~(1). Adjust the gate according to the adjustment standard. (\*Refer to page 9-48)

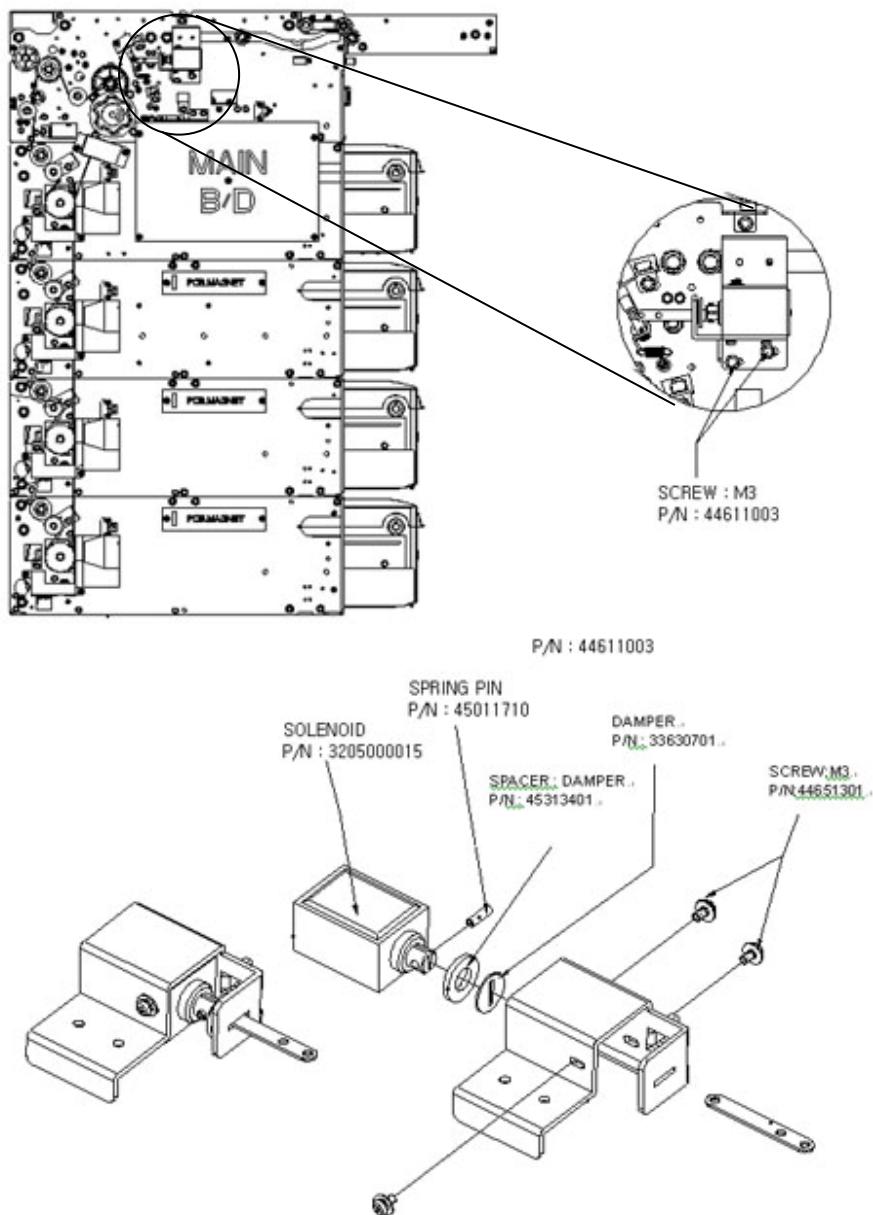


Fig.6.49 Gate Solenoid Assembly

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**6.6.3.6 Clutch Assembly**

The clutch assembly is composed of four clutches as shown in the below figure.

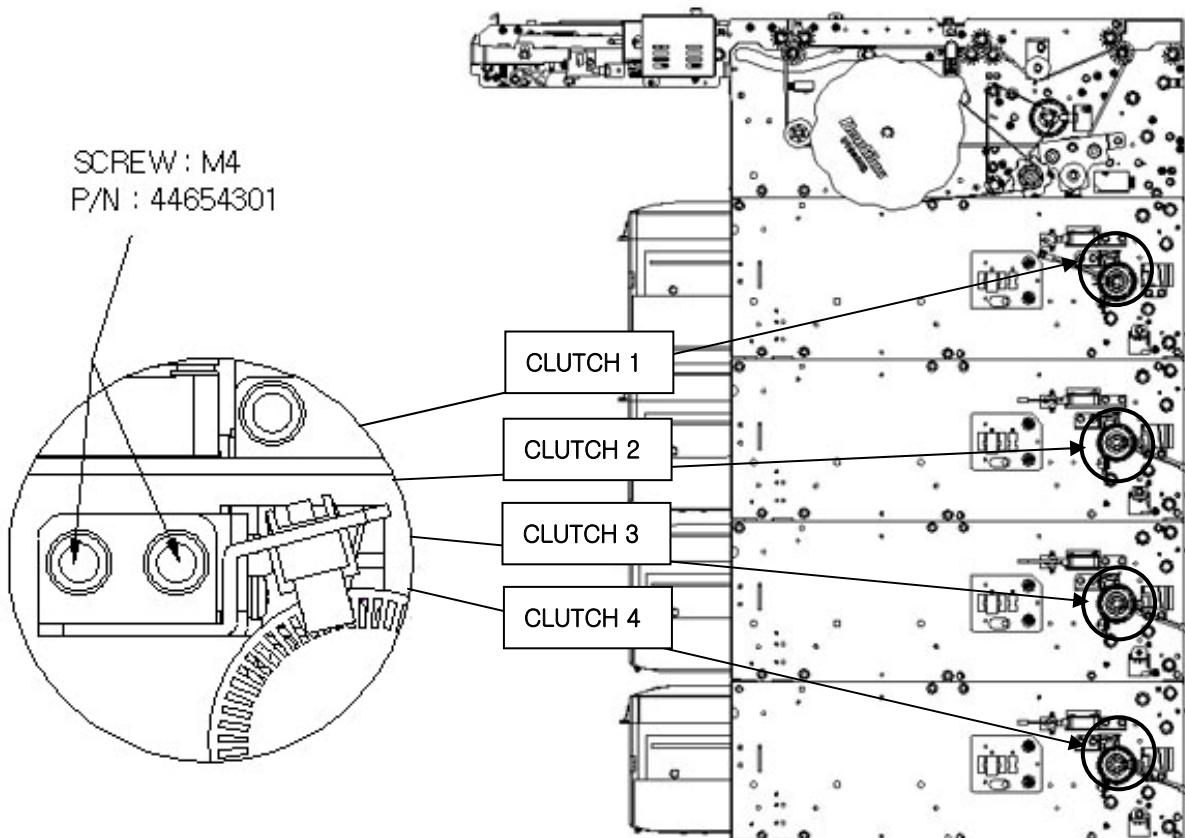
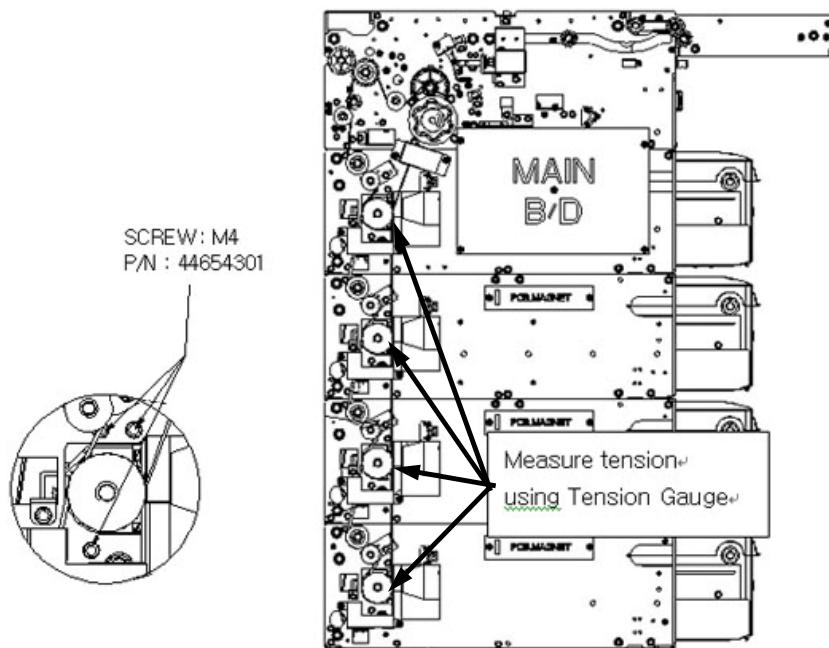


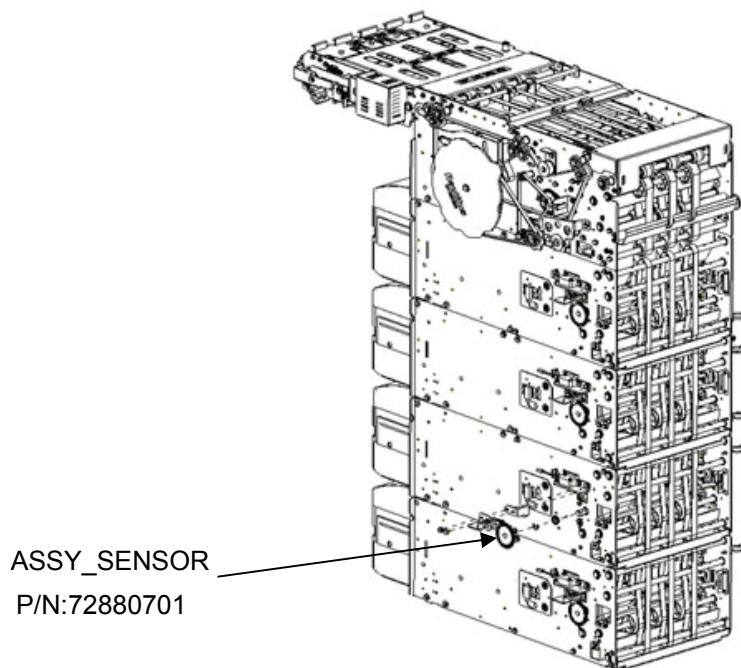
Fig. 6.50

**MoniMax 5600****6. Cash Dispensing Unit**

- 1) To remove the clutch, unscrew the encoder sensor bracket of the clutch to remove, as shown in the above figure, by unscrewing the M4 fixing screw (2 places). Then, unscrew the M4 fixing screw (3 places) at the opposite side.



- 2) Remove the M4 fixing screw (1 place), E-Ring and encoder as shown in the below figure.



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- 3) Remove the clutch assembly.

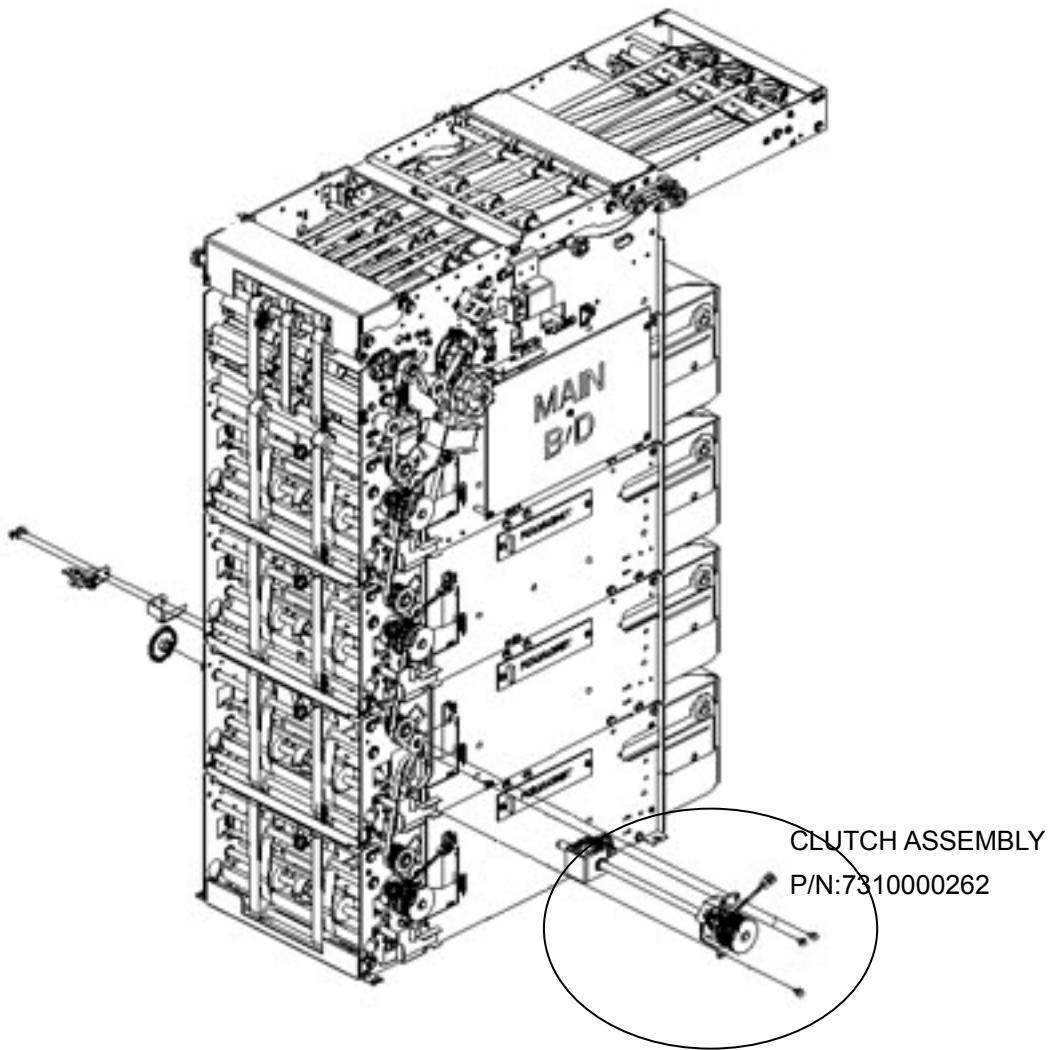


Fig. 6.51

- 4) Replace the clutch assembly and assemble in the order of 4) ~ 1).

Note) When replacing the clutch assembly, adjust the tension pulley so that belt tension will be about 100g(0.22 lb) to the direction ① and about 200g ~ 300g(0.44~0.66 lb) to the direction ② when the timing belt is pressed by about 3mm(0.12 inch), using the tension gauge.

#### 6.6.3.7 Presenter Assembly

1) Remove the cables connected to sensor in Presenter assembly

Be careful not to break the connector pin when removing

2) Loosen M4 fixing screw (2 places) and M3 fixing screw (2 places) on conjunction of Presenter assembly and upper feeding assembly

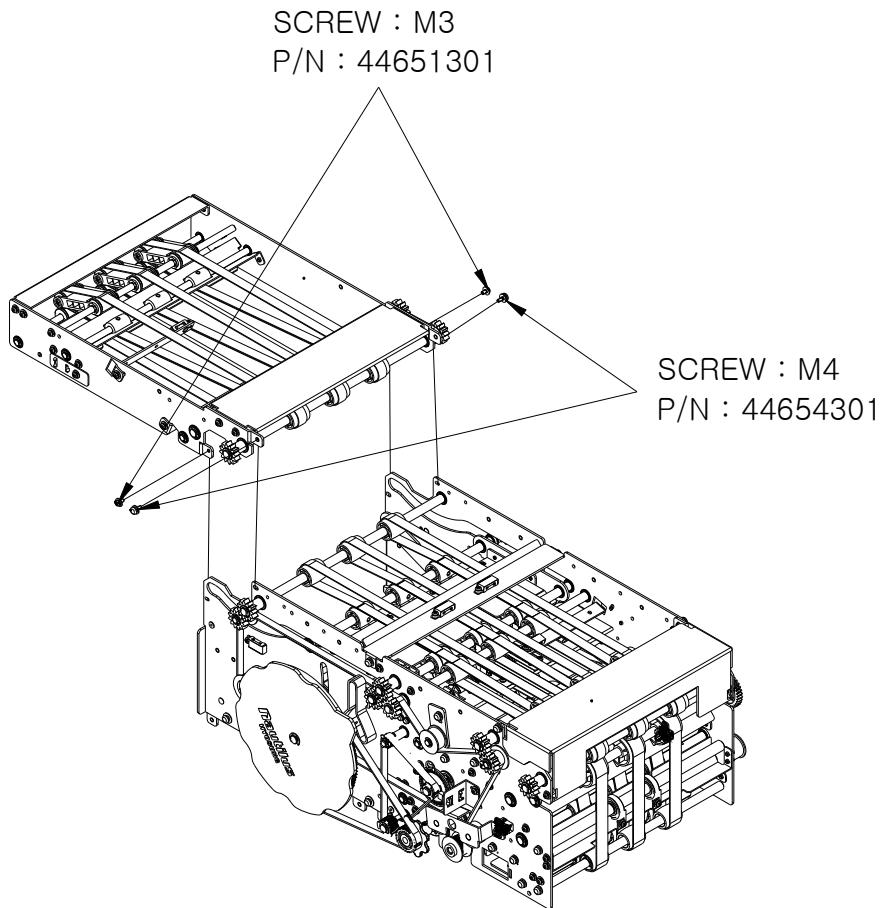


Fig. 6.52

MoniMax 5600

6. Cash Dispensing Unit

**6.6.3.8 Cassette Assembly**

**1) Latch**

- ① Open the cassette cover and pull back the push plate to lock.
- ② Loosen latch bracket M3 screw (2 places) as shown in the figure and remove it from the cassette body.
- ③ Press the latch snap lock with hands to remove the latch from the latch bracket.
- ④ Replace the latch.
- ⑤ Assemble in the order of ③~①.

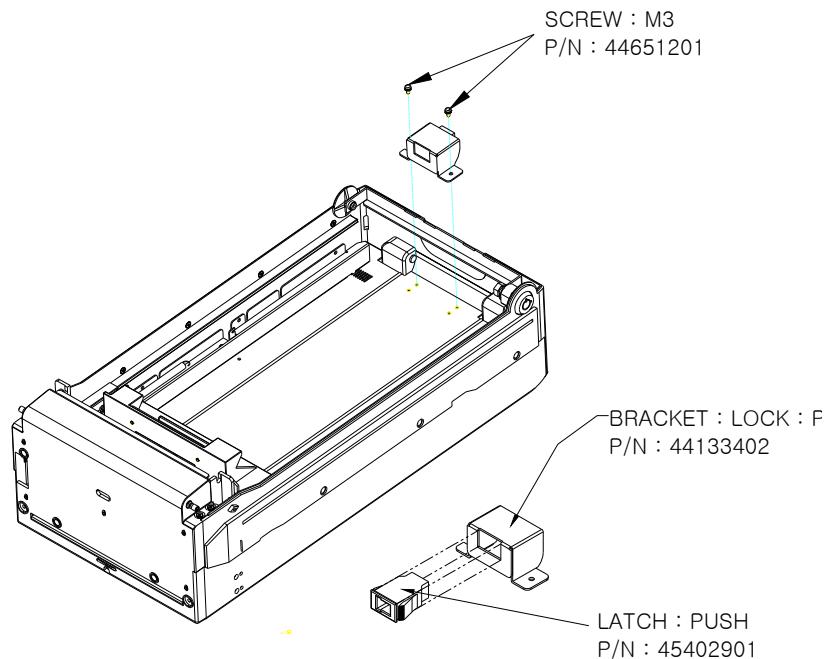


Fig. 6.53

**2) Push Plate**

- ① Open the cassette cover and pull back the push plate to lock.
- ② Loosen push plate M3 screw (2 places) as shown in the figure and remove it from the cassette body. Remove the spring connected to the push plat hole at the same time.
- ③ Replace the push plate.
- ④ Assemble in the order of ②~①. Adjust the push plate groove to the push plate guide in time of assembly.

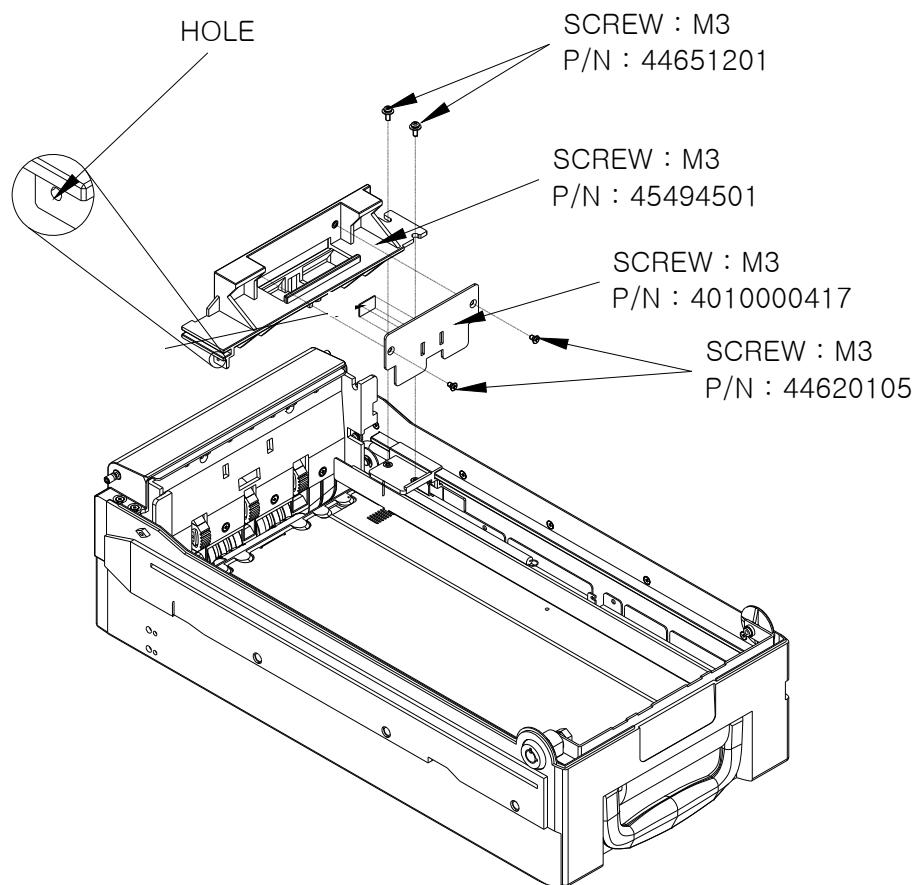


Fig. 6.54

### 3) Side Guide and Upper Guide

- ① Open the cassette cover and pull back the push plate to lock.
- ② Remove the push plate by referring to the push plat replacement method (previous section).
- ③ Loosen side guide M3 fixing screw (4 places).
- ④ Remove the side guide while pushing the push supporter to the notes separation unit as much as possible. Then, replace with the side guide that fits into the notes type.
- ⑤ Assemble the unit in the order of ④~①.

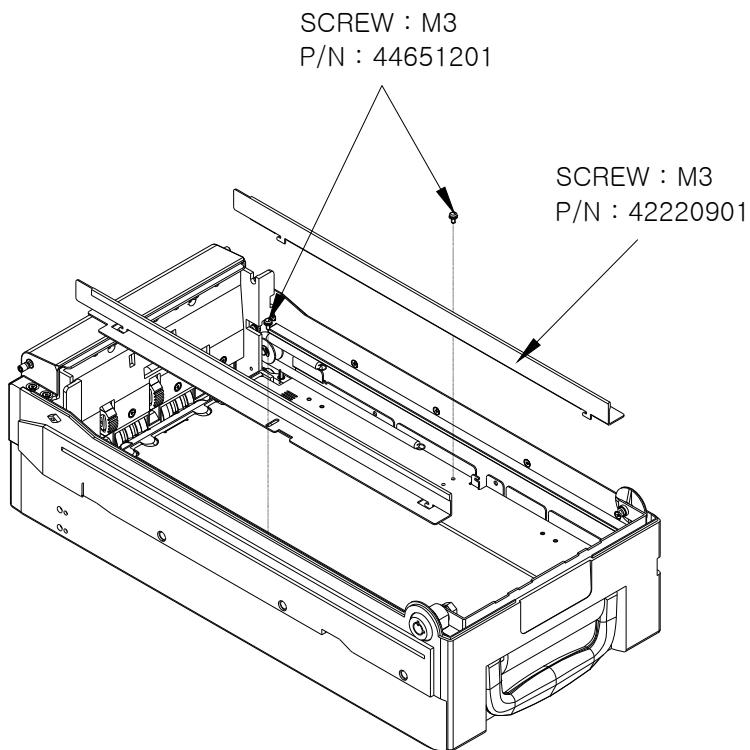


Fig. 6.55

- ⑥ Adjust space between the upper guide and the notes using the spacer, as shown in the figure below, so that it matches with the note type. At this time, use the proper number of screws according to that of the spacers.

**MoniMax 5600**

**6. Cash Dispensing Unit**

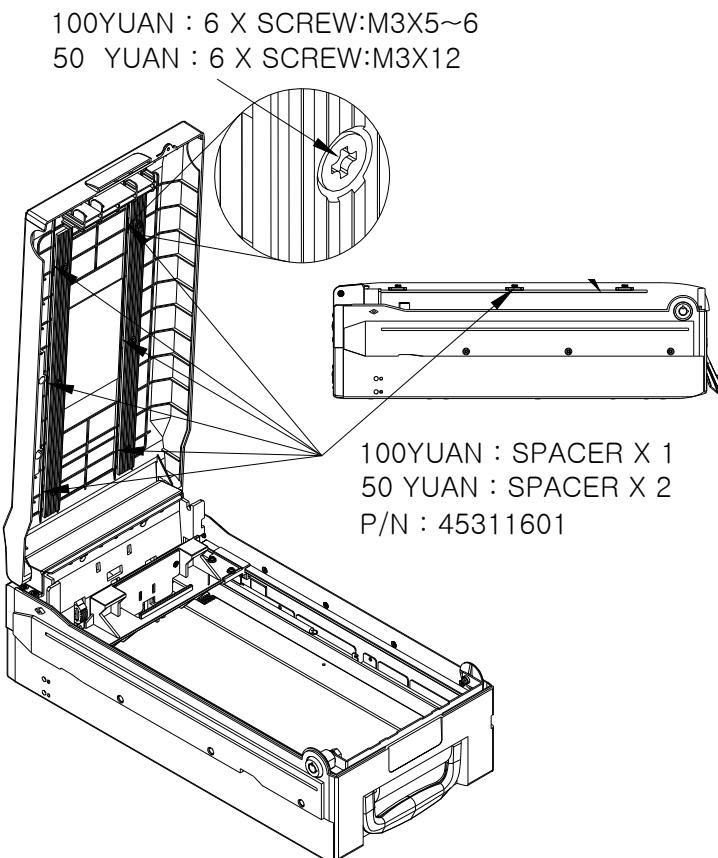


Fig. 6.56

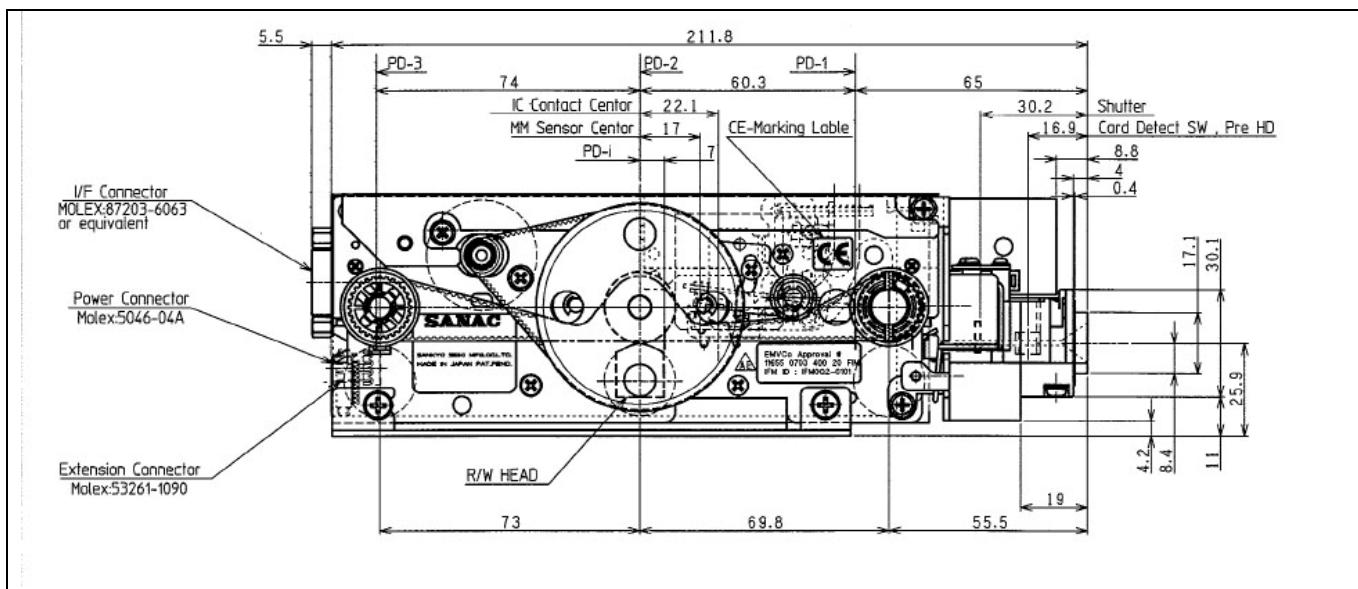
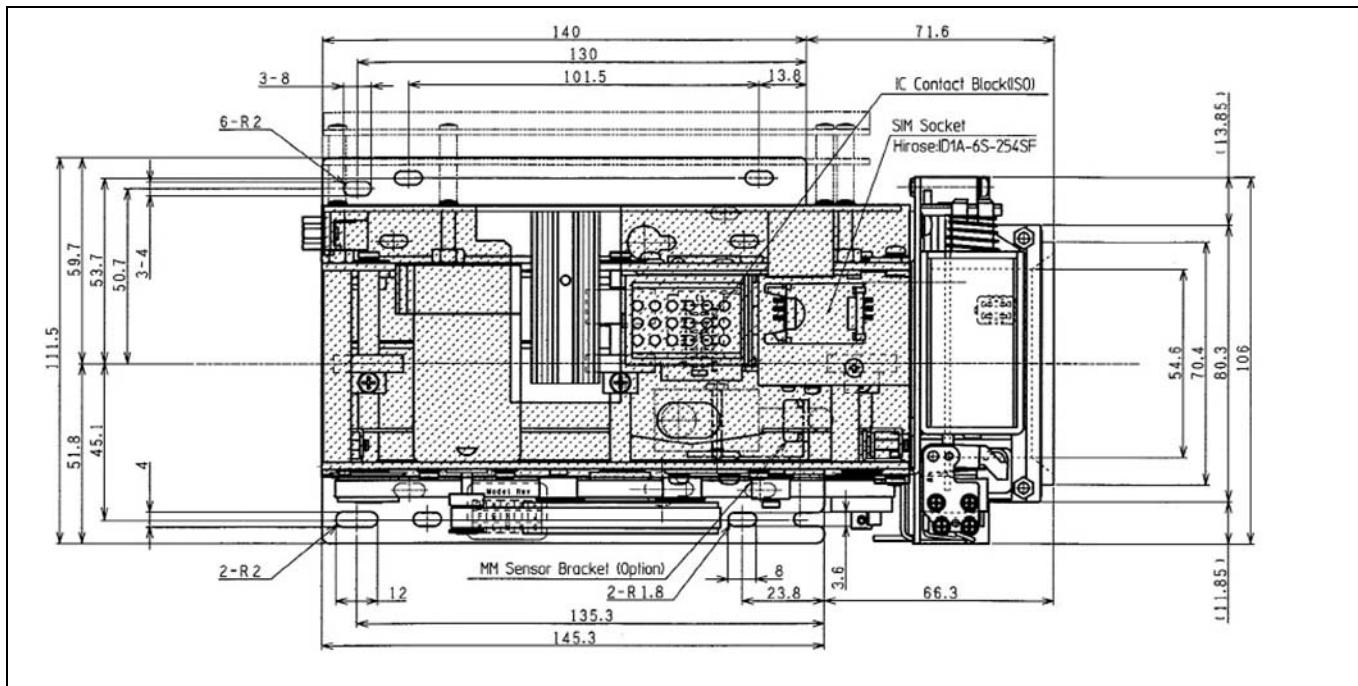
## **Chapter 7. Magnetic Card Unit**

MoniMax 5600

7. Magnetic Card Unit

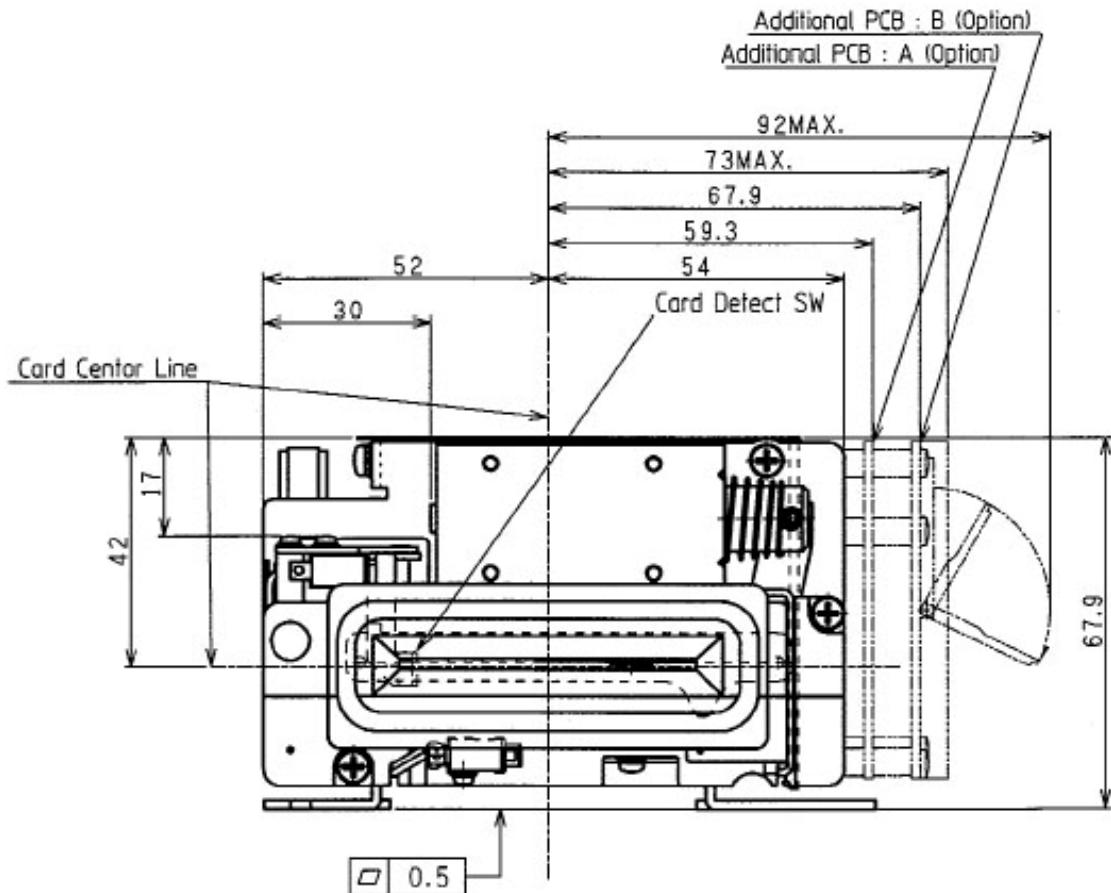
**7.1 Magnetic Card Unit : Motor Driven Type**



**MoniMax 5600****7. Magnetic Card Unit****7.1.1 Outside drawing and dimension**

## MoniMax 5600

## 7. Magnetic Card Unit

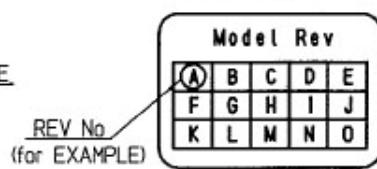
**LABEL Detail**

(for example)

## MODELLABEL DETAIL



## REV.LABEL DETAIL



## △ EMV.LABEL DETAIL

EMVCo Approval #  
11655\_0703\_400\_20 FIM  
IFM ID : IFM0Q2-0101

EMV TYPE APPROVAL No.

### 7.1.2 Basic specification

#### **Card feed**

Round trip and capture

#### **Card feed speed**

At mag-stripe Read/Write 190 mm/s±3%

At card transport only 380 mm/s (typ.)

#### **Card feed time**

Approx. 1.5 s (Round trip)

#### **Card eject length**

More than 20mm

#### **Dielectric strength**

DC200 V, 1 min (Measured between PCB ground & frame)

#### **Insulation resistance**

More than 10 MΩ at DC 200 V (Measured between PCB ground & frame)

#### **Mag-stripe Read/Write**

ISO/IEC Track 1,2,3 : Read/Write

#### **Interface**

RS232C/D compatible

Interface connector : CD5509PA1F0(Cvilux) or equivalent

#### **Compatibility**

The transport has compatibility with ISO-IEC standard cards.

Conform to ISO/IEC7811/6 high coercitity cards.

(provided 219kA/m(2750 Oe) only, Write is option\_

EMV2000 ver 4.0

#### **Pre-head detect**

ISO/IEC Track 2 or ISO/IEC Track 3

### Shutter gate

1peace, normal closed

### MM sensor bracket (option)

Per appearance drawing

### IC card Read / Write

IC contact location : ISO/IEC7816 Front side lower position

Communication circuit : Exist

Vcc : DC+5V±5% or DC+3V±5% (selected by command), Max 80mA

Vpp : Open

CLK : 3.58 MHz (basis), 7.16 MHz (automatically selected by firmware.)

Baud rate : 6991 – 38490 bps

IC card type : T=0, T=1

PPs : supported.

### Environmental condition

Operating temperature/humidity : 5°C ~ 50°C, 20% ~ 80% RH

Storage temperature/humidity : -20°C ~ 70°C, 20% ~ 80% RH

(Condition : Storing ICRW for 12 hours at the normal conditions without any operation after keeping it at the above storage temperature and humidity for 96 hours without operation, no functional error is found.)

Normal conditions : 20°C±5°C, 35%~60% RH

Mounting Horizontal (Mounting plate on horizontal surface)

Maximum limit : 40°C±3°C, 90% ~95%RH, 96 hours

Shock durability : 294 m/s<sup>2</sup> (30G), 11ms

### Life

ICRW Unit : 1,000,000 card passes

(One time card pass means the round pass with forward and backward movement.)

### Reliability

Mag-stripe read/write error rate : Less than 1/1,000 cycles

-Condition : at indoor normal condition, card :SANACARD-T5 Flat

-Card feed : 1 cycle/10s

-1 cycle : one Mag-Track Write Command and one Mag-Track Read Command function

## MoniMax 5600

## 7. Magnetic Card Unit

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IC contact connection Error Rate : Less than 1/10,000 times

-Condition : 1 time = 1 try + 2 retries

-1 try : To carry the card to IC contact position and set IC contact

MTBF (only for PCB) : More than 200,000 hours

### Other functions for reliability

- Self diagnostics

- Photo sensor dirt /age detect using emission amount change of Sensor LED.

- In case of power down, a card under transaction can be conveyed to the card gate by backup power supply which will be provided by customer.

- Definition of power down : Supply voltage – 20V DC or less

Duration time : over 15m sec

## MoniMax 5600

## 7. Magnetic Card Unit

### 7.1.3 Usable card

#### Magnetic card

ISO/IEC 7810, 7811/1-5

ISO/IEC 7811/6 (option) Read is accept

#### IC card

ISO/IEC 7816 (Contact position : Front side, lower position)

EMV '96 ver 3.1.1

EMV2000 ver 4.0

Note: EMV Standard is given higher priority than ISO/IEC Standard when there are any discrepancy between them.

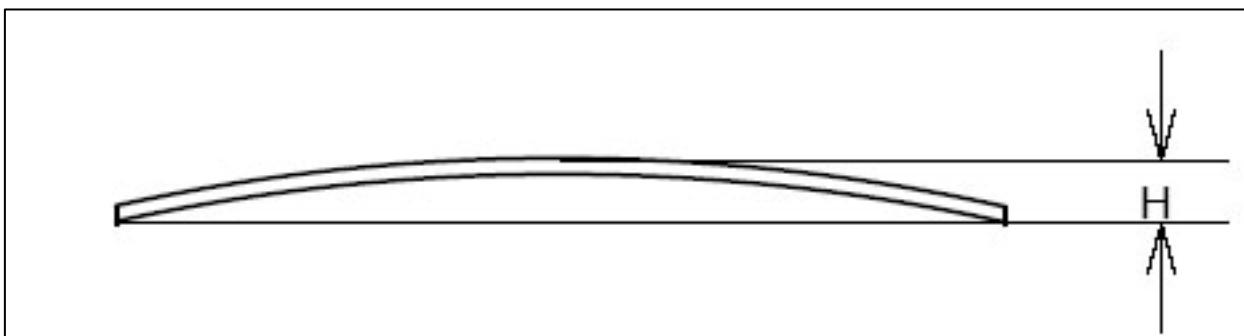
#### Cleaning card

Specification #68-76-02-51-4 (Standard type)

or #68-76-02-51-8 (With mag-stripe type)

#### Warped cards

This term refer to an evenly warped card having a height (from the top of the convex surface to the base of the warped edge)



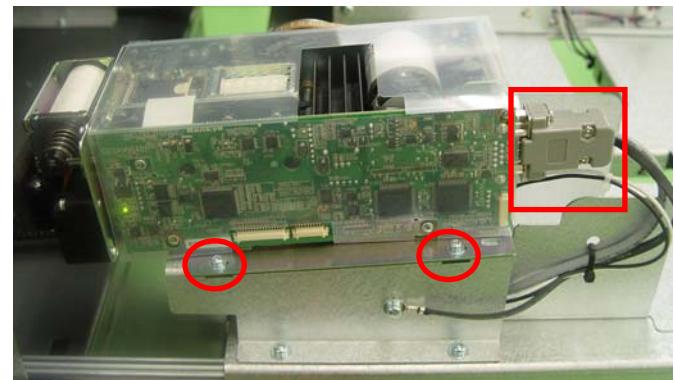
- a) "H"≤1.0 mm for able to Card back entry.
- b) "H"≤2.5 mm for able to Mag-stripe R/W (only low-slice read)
- c) "H"≤2.0 mm for able to IC R/W.
- d) "H">> 4.0 mm card jamming will be happened (include card eject in case of power down.)

**MoniMax 5600**

**7. Magnetic Card Unit**

**7.1.4 Removal/Installation Procedure of Magnetic Card Unit**

- 1) Open the upper door of the ATM and turn off the power.
- 2) Remove 4 screws on the both sides of the MCU and disconnect the connector from the MCU to disassemble the MCU.



- 3) Assemble the MCU in the reverse of the disassembly.

## **7.2 Magnetic Card Unit : A**

### **7.2.1 Overview**

This card reader is a dip-type card reader located to the right of the display screen, on the front panel. By dipping (inserting and removing) a bankcard into the card reader, the cardholder begins their transaction session. The card reader has an improved bezel design that allows the customer to retain the card when they are inserting it into and withdrawing it from the reader.

### **7.2.2 Appearance and Dimension**

The following figure shows the external appearance of dip type card reader. Its dimensions are 83.8mm (W) X 34.2mm (H) X 114.5mm (L).



## MoniMax 5600

## 7. Magnetic Card Unit

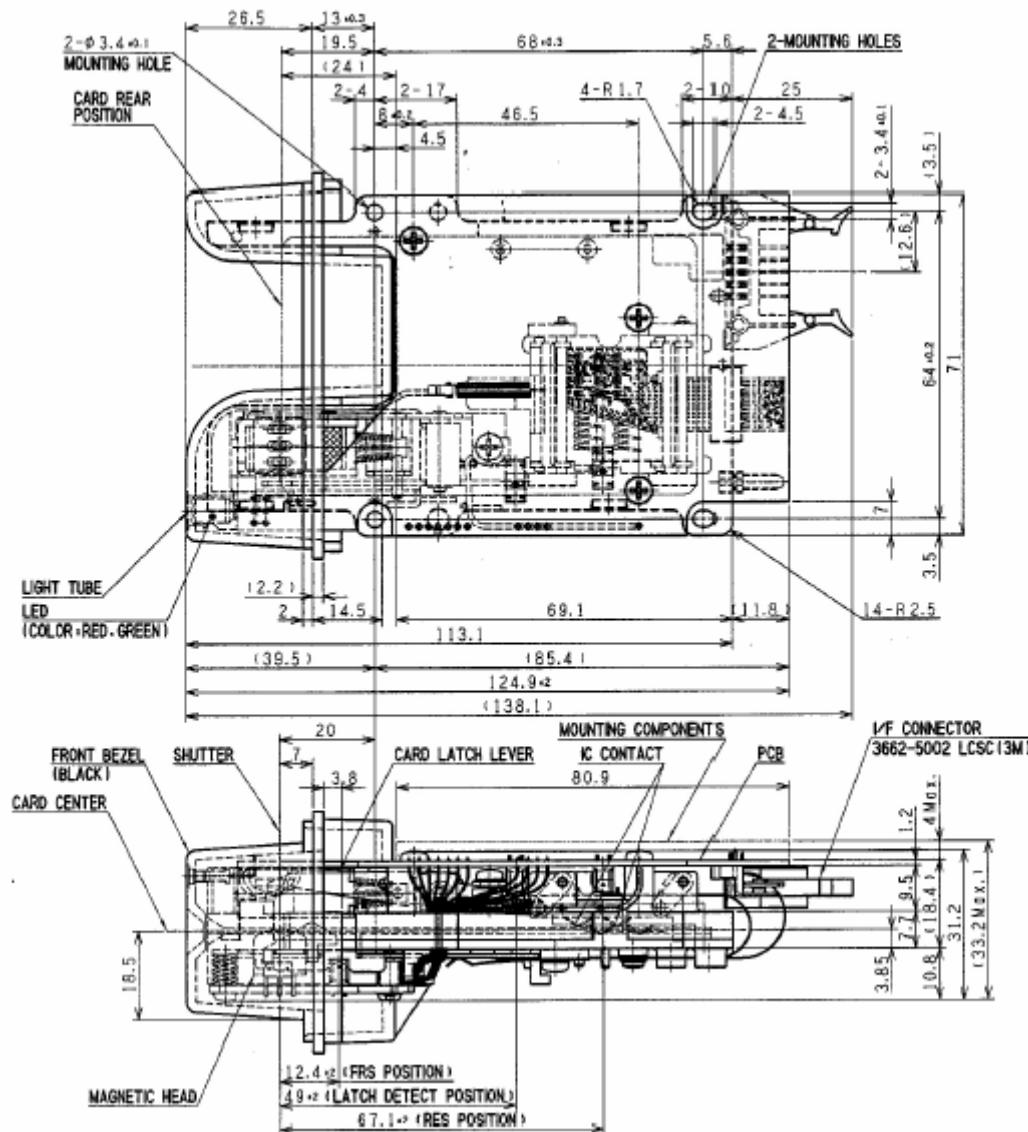


Fig.7.1 Appearance and Dimension of Card Reader

**MoniMax 5600****7. Magnetic Card Unit****7.2.3 Applications**

- ATM/CD
- Kiosk terminals
- Payment systems
- Retail POS terminals
- Access control terminals
- Other ID terminals

**7.2.4 Features**

- High reliability and durability
- IC Card protocol handling for ISO and EMV Level 1 approved

**7.2.5 Specification**

IC Contact	ISO/IEC 7816/1-3 Protocol Handling (T=0 and 1) EMV 2000 ver 4.0 Level 1 approved
Magnetic Stripe	ISO/IEC 7810, 7811 series 7813 Read
Power Supply	+12V DC
Signal Interface	RS232C
Unit Life	More than 300,000 passes
Dimensions	80mm(W) x 125mm(D) x 50mm(H)
Weight	170g approx

### 7.2.6 The Entire Unit Replacement

- 1) Turn off the system power.
- 2) Disconnect the connectors.
- 3) Loosen the screws on the front panel and remove the card reader from it carefully.

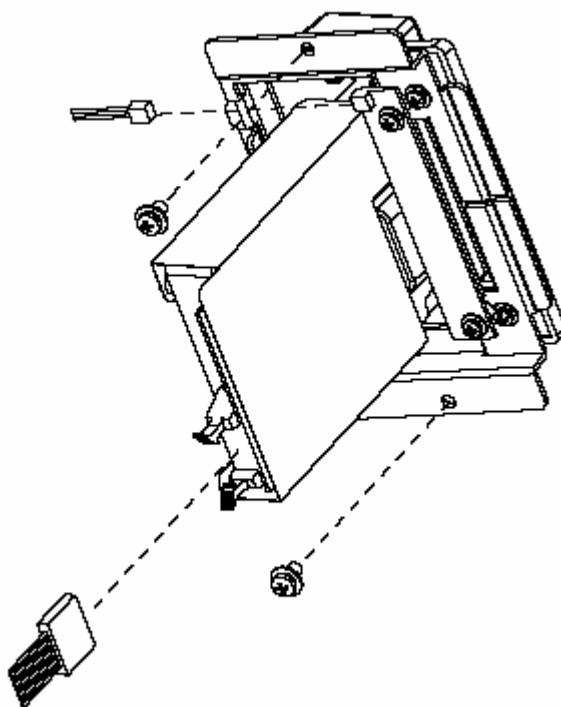


Fig. 7.2 Separating MCU (1)

**MoniMax 5600**

**7. Magnetic Card Unit**

- 4) Separate Mylar sheet by removing two screws as shown in below picture.
- 6) Separate the card reader by removing two screws.

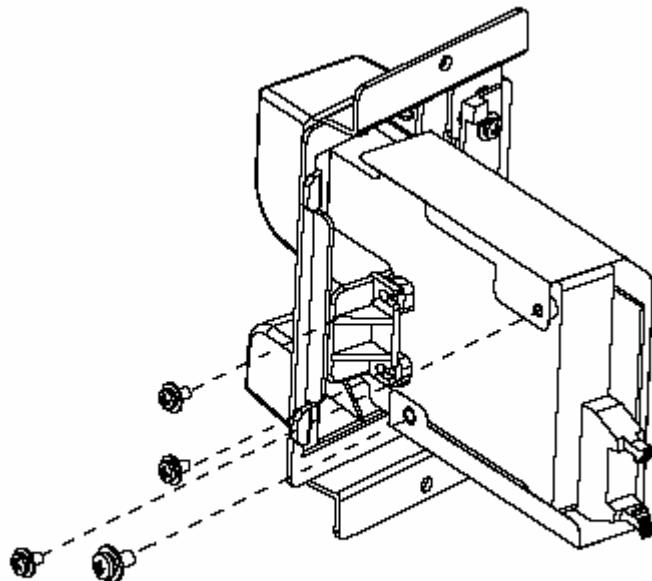


Fig. 7.3 Separating MCU (2)

## 7.3 Magnetic Card Unit : B

### 7.3.1 Features and Specifications

This Magnetic Card Unit performs the following major functions:

Reads magnetic stripe cards

Communicates with ISO smart cards and many popular memory cards

Supports one on-board SAM (Security Access Module)

Includes an integrated USB interface

Optionally supports Contactless Smart Card communication

The Reader communicates to a host using an RS-232 or USB interface with a defined protocol and command set. The 3-track Reader has an industry standard mechanical footprint. The IntelliStripe 65 is designed for self-service applications such as pay telephones, vending machines, kiosks, and fuel pumps.

## CONFIGURATIONS

Unless otherwise specified below, all of the IntelliStripe 65 readers include the following capabilities:

- USB/RS-232 interface
- Smart Card connector with 8-contacts
- Single SAM socket
- Security Gate
- Card retention latch with power fail release
- Single 3-track head
- Bezel with built-in red/green LED

## Standard Features

Standard features of the IntelliStripe 65 are as follows:

- Multiple bezel styles allow for optimized mounting and integration
- Rugged-High impact plastic with read head attached to beam mount
- Vandal Resistant—Open chassis design provides superior debris clearing; half-card drop-out allows
- half-size credit cards and coins to be cleared from insert channel
- RS232 and USB interfaces
- On board intelligence for transporting large blocks of data using a defined protocol and command set

**MoniMax 5600****7. Magnetic Card Unit**

- Test LED External LED port Optional Cutout in Bezel for LED Program Flash upgradable

**Specifications**

DATA FORMAT SPECIFICATION	
Reader Configuration	Data Format Specification*
Mag-Stripe Functions Track 1,2,3 only	ISO/AAMVA/ JIS formats ISO 7810, 7811, JIS x 6302 Type 2
Smartcard Functions	ISO 7816 T=0 and T=1 protocols, many popular memory cards EMVCo Level 1 Approval
* ISO (International Standards Organization), AAMVA, (American Association of Motor Vehicle Administrators), JIS (Japanese Industrial Standard)	
OPERATIONAL	
Card Speed	3 IPS (7,62 cm/sec) to 50 IPS (127, cm/sec)
Recording Method	Two-frequency coherent phase (F2F)
MTBF	Head: 1,000,000 passes (500,000 Insertion Cycles) SC contacts: 1,000,000 insertions
ELECTRICAL	
Input Voltage	12.0VDC ± 5%
Current	500mA max, (750mA max with contactless smartcard option) 50mA typical, (230mA typical with contactless smartcard option)
MECHANICAL	
Chassis Mounting Options	
Front Flange	See Section 2, Figures 2-1 and 2-2
Side Mounting Studs	See Section 2, Figures 2-1 and 2-2
Side Mounting Holes	See Section 2, Figures 2-1 and 2-2
Dimensions (Core Chassis)	
Overall Length	4.70" (119,4mm)
Mounting Depth	3.80" (96,5mm) when mounted with front flanges
Height	1.40" (35,6mm)
Width	2.60" (66,0mm) without mounting bosses or flanges
Weight	5.02oz (142.2gr)
ENVIRONMENTAL	
Temperature Operating Storage	32°F to 122°F (0°C to 50°C) -40°F to 158°F (-40°C to 70°C)
Humidity Operating Storage	10% to 90% noncondensing 10% to 90% noncondensing
Altitude Operating Storage	0-10,000 ft. (0-3,048 m.) 0-50,000 ft. (0-15,240 m.)

### 7.3.2 Usable Card

1. Multiple card types are supported.

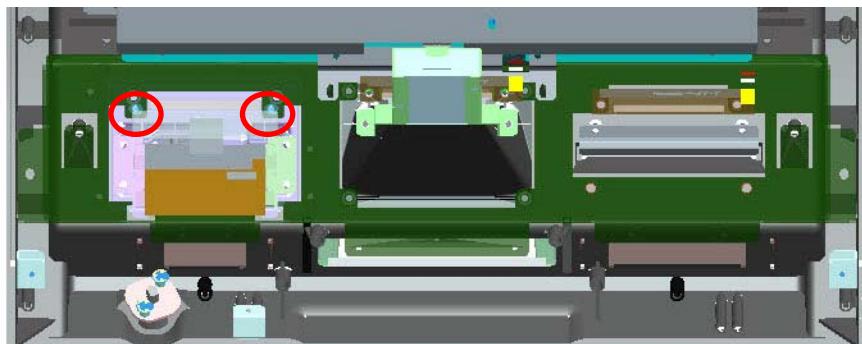
The default card type (after power up) is 0x00, which supports microprocessor cards (T=0/T=1). The card type may be selected by the host application by setting the desired type in Property 01 (Card Type). The specified card type is used on all connectors until a new card type is set via the Set Property command.

2. There are two major categories of card types.

- The first are ISO 7816-3(1997) Microprocessor cards. Most Microprocessor cards available today comply with 7816-3 and this manual does not address their functionality in depth.
- The second category is Memory or Synchronous cards. There are numerous Memory cards available in the market. Some of them conform to ISO 7816-10, some don't. There are no standards for command sets used to control these cards. The protocols and commands used to control these cards vary widely.

### 7.3.3 Removal /Installation Procedure of Magnetic Card Unit

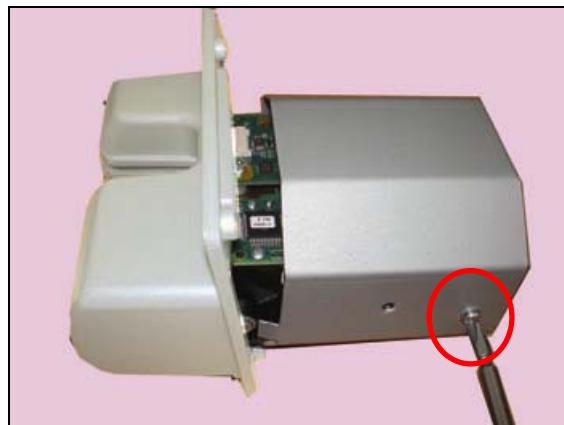
- 1) Open the upper door of the ATM and turn off the power.
- 2) Remove 2 screws on the both sides of the MCU and disconnect the connector from the MCU.



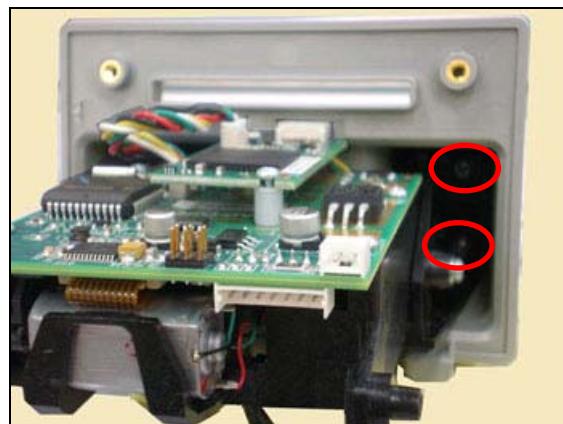
**MoniMax 5600**

**7. Magnetic Card Unit**

3) Disassemble the MCU from the front and disconnect the cover of the MCU by removing 2 screws.



4) To disassemble the bezel of the MCU, remove 4 screws as shown in below picture.



**MoniMax 5600**

**7. Magnetic Card Unit**



5) Assemble the MCU in the reverse order of the disassembly.

MoniMax 5600

**8. Receipt Printer**

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## **Chapter 8. Receipt Printer**

## 8.1 Overview

The Receipt Printer is located on the right side when opening the rear panel, and can be divided into 3 assemblies.

Body Assembly

TPH (Thermal Printing Head) Assembly

Outlet Assembly

The Body Assembly contains the hopper for the paper roller and the controller board. Next to the hopper is a sensor that detects the paper low status and issues a warning. This Body Assembly has a mechanism that reduces the stress coming from the paper roll and maintains paper tension. Also, if an attendant inserts the paper into machine, it automatically sets the paper and performs an advance paper and cut.

TPH (Thermal Printing Head) Assembly is a printing engine equipped with a thermal printing head and a cutter. It prints out what has been commanded by the Host, cuts the printed output and sends it to the Outlet Assembly.

Outlet Assembly has a long transport section which enables landscape printing. It is also easy to maintain or repair in case of receipt jams because of its open structure.

### 8.1.1 Appearance and Dimension

Dimensions of receipt printer are as follows:

145.8mm(W) X372.8m(D) X267.3mm(H) (316.5mm for Ø210 Roll)

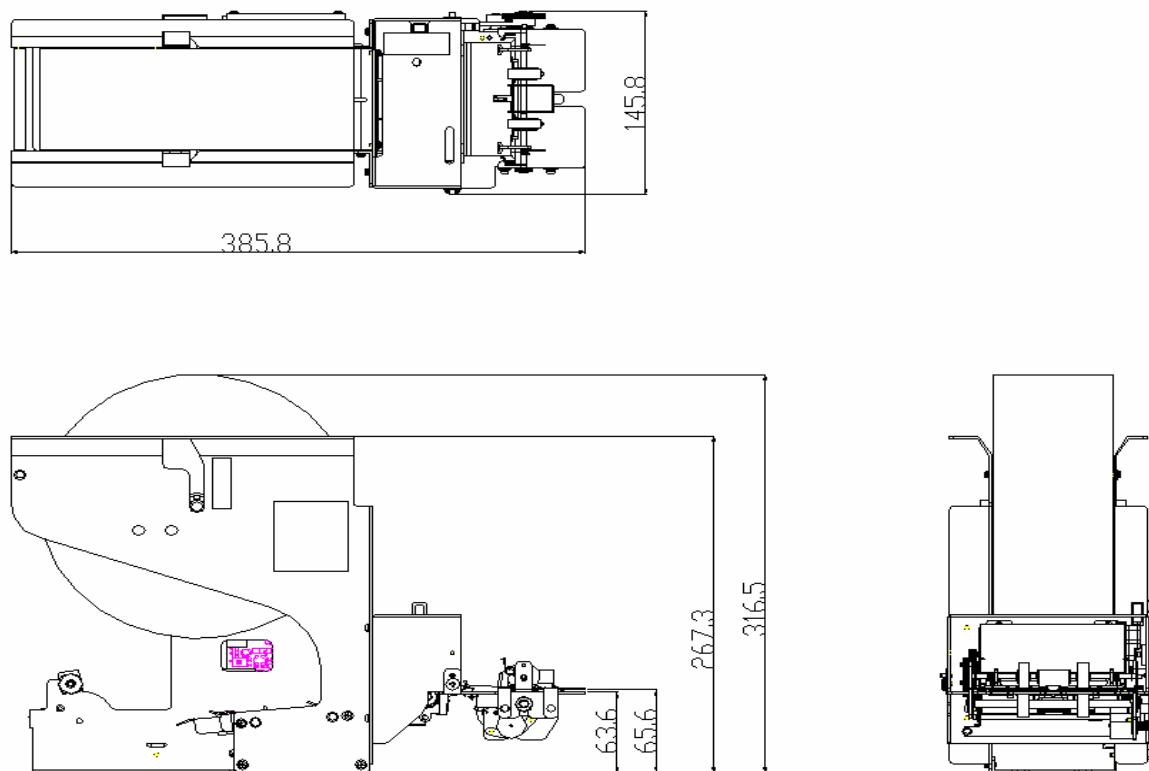


Fig. 8.1 Appearance of receipt printer

### 8.1.2 Basic Specifications

Basic specifications of the Receipt Printer are summarized as follows.

Item	Specifications		Note
Printing Type	THERMAL LINE Printing Type(8dots/mm)		
Maximum Print Length	36~40 letters/line (based on Alpha Numeric value, Font 12x24)		
No. of Print Lines	Max. 23lines/print (based on 1print=112mm )		
Valid Printing Width	Max. 72mm		
Type of Printer Letter	Image Print Type		
Paper	Type	External Printing Thermal Paper	
	Width	80 +0.0 -0.5mm	
	Exterior	Max. φ210mm	
Type of Paper Setting	Semi-Auto loading		
Type of Receipt Cutting	Full/Partial Cut		
END Detection Function	Yes		
No. of Transaction	Approximately 5000 transactions/Roll (Φ210)		Based on 1transaction=112mm standard (thin type : 55gsm)
Communication Type	USB 2.0		

**Note)** Thickness of paper is available up to 100 $\mu\text{m}$  and life of cutter is 300,000 times.

### 8.1.3 Specifications of DIP S/W setting

Control MEMORY scope by DIP S/W. (In case of SWITCH OFF, DIP S/W logic is 1.)

No.	DIP S/W No.		Description
	SW 1	SW 0	
1	0		9600BPS
2	1		115200BPS
3		0	BLACK MARK is unavailable.
4		1	BLACK MARK is available.

### 8.1.4 Functional Description

There are 3 major functions of the Receipt Printer as follows.

1) Checking the status of the machine and setting paper.

2) Printing & Cutting

- Print Start (Thermal Printing Head Fire)

- Black Mark Start and Stop

- Cutting

3) Ejecting

- Releasing the cut paper respectively

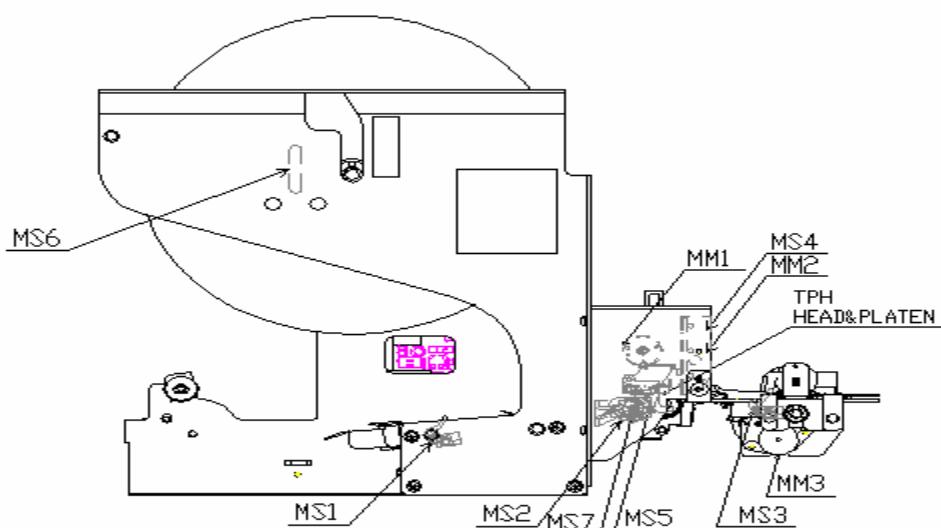


Fig. 8.2 Layout of sensor and actuator

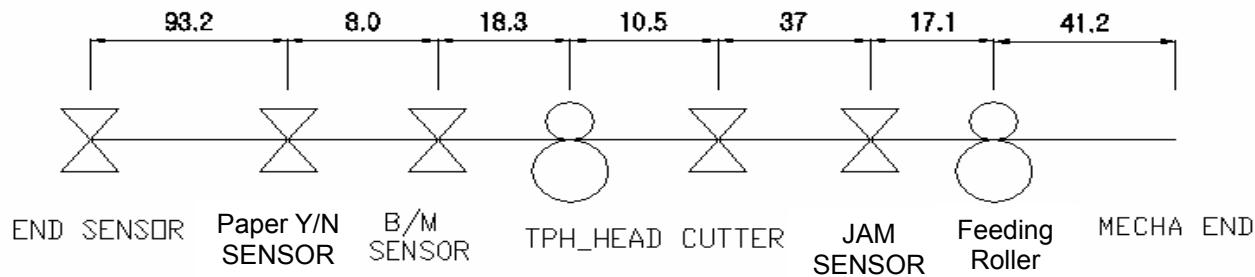
**MoniMax 5600****8. Receipt Printer**

Fig. 8.3 Distance between sensor and actuator roller (Approximately)

The symbols, names, and major functions of each sensor and electromagnetic component are summarized in the following table.

NO	SYMBOL	NAME	MAJOR FUNCTIONS	DEFAULT VALUE
1	MS1	END DETECTION SENSOR	END DETECTION	DEFAULT:OFF
2	MS2	AUTOLOAD SENSOR	PAPER AUTOLOAD/ PAPER EMPTY CHECK	DEFAULT:OFF
3	MS3	JAM SENSOR	PAPER JAM SENSOR	DEFAULT:OFF
4	MS4	CUTTER SENSOR	CUTTER LOCATION DETECTION	DEFAULT:ON
5	MS5	TPH PLATEN SWITCH	TPH PLATEN OPEN SWITCH	DEFAULT:ON
6	MS6	SENSOR FOR DETECTING REMAINED PAPER (OPTION)	DETECTING REMAINED PAPER	DEFAULT:OFF -
7	MS7	BLACK MARK SENSOR	BLACK MARK DETECTION	DEFAULT:OFF
8	MM1	FEEDING MOTOR	PAPER FEED	
9	MM2	CUTTER MOTOR	CUTTER OPERATION	
10	MM3	FEEDING MOTOR	PAPER FEED	

The major detection functions of the above sensors and electromagnetic components include paper empty check by section, checking the status of “cutting” using the cutter position switch, OPEN/CLOSE detection of the TPH cover, and detection of the TPH overheating and paper jams.

## 8.2 Troubleshooting

### 8.2.1 Troubleshooting Tools

Following is the procedures for handling problems related to the Receipt Printer that includes receiving complaints, dispatching a technician to the branch, verifying the problem, inspecting the machine, and taking proper actions.

#### Trouble Verification

- Communication LED on the Controller Board
- Power LED on the Controller Board
- Error Code on the Supervisor screen
- Software Trace file
- Paper Jams in the Transport path and existence of foreign substances

Go to the Supervisor Mode and see if there is an error code displayed at the bottom of the screen. If there is an error code, identify the type of error by checking the error code table in the manual. If no error code is present, enter the Technician Mode to initialize the system or conduct a functional test to see if the problem occurs.

### 8.2.2 Scope of Repair at the Field Level (Recommendations)

The scope of repair that can be supported at the field level is limited only to fixing the communication or power cable problems, resolving jams, checking motor, sensor or controller board problems. Adjustments, lubrication and cleaning are also supported in the field. For problems with other components, replace the Module and inspect and repair it at the Depot level.

This is just a recommendation and can be adjusted depending on the field conditions or capability of the technician involved.

No	Field repair items	Tool	Remark
1	Communication Cable	Slotted screw driver, Meter	
2	Power Cable		
3	Receipt Jam		
4	Motor	Slotted screw driver, Meter	
5	Sensor		
6	Controller Board	Screw driver, Meter	
7	Mechanical Adjustment		
8	Lubrication		
9	Cleaning	Air blower, Q-tip, Swab	

Since items not included above cannot be checked or repaired in the field, replace the entire Module and check and repair it at the Depot level.

### 8.2.3 Troubleshooting Procedure

- 1) When arriving at the branch which has reported the complaint, identify the problem focusing on the module where the problem has been reported. For further details, refer to "Error code and Troubleshooting" chapter. If the problem lies in the Receipt Printer, move to the next step.
- 2) Enter the Supervisor Mode and check the Status LED on the initial screen. Verify if the error field contains a red light and if there is any error code displayed at the bottom of the screen. If there is an error code appearing on the screen, identify the type of error by checking the error code table in the manual.
- 3) If no error code is present, enter the Technician Mode to initialize the Receipt Printer or conduct a

functional test to see if the same problem occurs.

- 4) Using the error code information in the manual, identify the items with potential problems and determine whether the repair can be supported in the Field. Error codes for the Receipt Printer are defined in "Error code and Troubleshooting" chapter.
- 5) If the problem falls into the category of field repair items, take immediate actions following the procedures described in Chapter 8.2.3.1~9. If not, replace the entire Receipt Printer.
- 6) When replacing the Receipt Printer, obtain and store the Journal and Log files.

#### **8.2.3.1 Communication Problem**

- 1) Check if the 2 LEDs(TxD, RxD) are blinking on the Controller Board of the receipt printer.
- 2) See if the USB Communication cable is properly plugged in at the CE engine and the controller. Reseat the cable connections on both ends. Check the cable for damage or worn places.
- 3) Go to the supervisor mode and enter the Start>Control Panel>Device Property, and see if the receipt printer inside the USB3-USB 1Hub is properly set up.
- 4) Replace the Controller Board.
- 5) Replace the CE engine.

#### **8.2.3.2 Power Problem**

- 1) Check if the LED (PWR) is illuminated on the Controller Board.
- 2) Measure the voltage at Controller Board using a volt meter and verify if the Board has normal voltage input.
- 3) Change the Controller Board.
- 4) Look at the LED status of the Power Supply and replace it if there is a problem.

### **8.2.3.3 Clearing Paper Jam**

- 1) First insert the key into the front upper door and turn it clockwise.
- 2) Then pull out the front panel outward.
- 3) First, check if there is a jammed paper around transparent guide.  
If so, after pressing the green lever, lift up the transparent guide and cut out the jammed paper with mechanical cutter carefully.

### **8.2.3.4 Controller Board**

If the following conditions occur, replace the Controller Board.

- 1) When turning on the ATM power, the RxD LED on the Controller board flashes a few times but TxD LED doesn't flash at all.
- 2) When pressing the Self Test switch on the Controller Board, the Controller Board does not work or strange letters comes out on the print out.
- 3) If you are having problems with communication, voltage, electromagnetic component Motor, Solenoid, Micro-clutch or sensors. If the power to the Controller Board is normal but the Power LED is not illuminated.

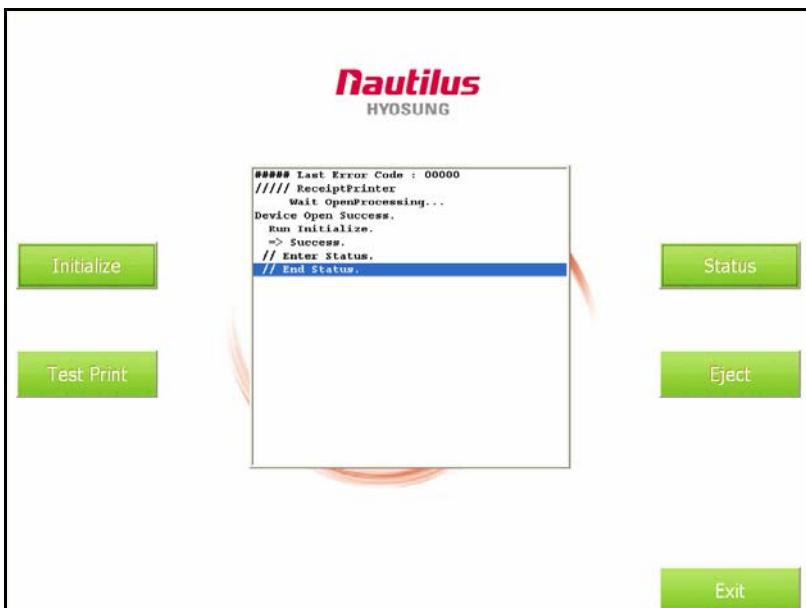
### 8.2.4 Diagnostic Mode

Using the Diagnostic Mode, verify the condition of the Receipt Printer. The test items include Device Reset, Sensor Status, Test Print, Top of form, Purge form test and Get Version. Go to the Technician mode > Receipt Printer to access this menu.

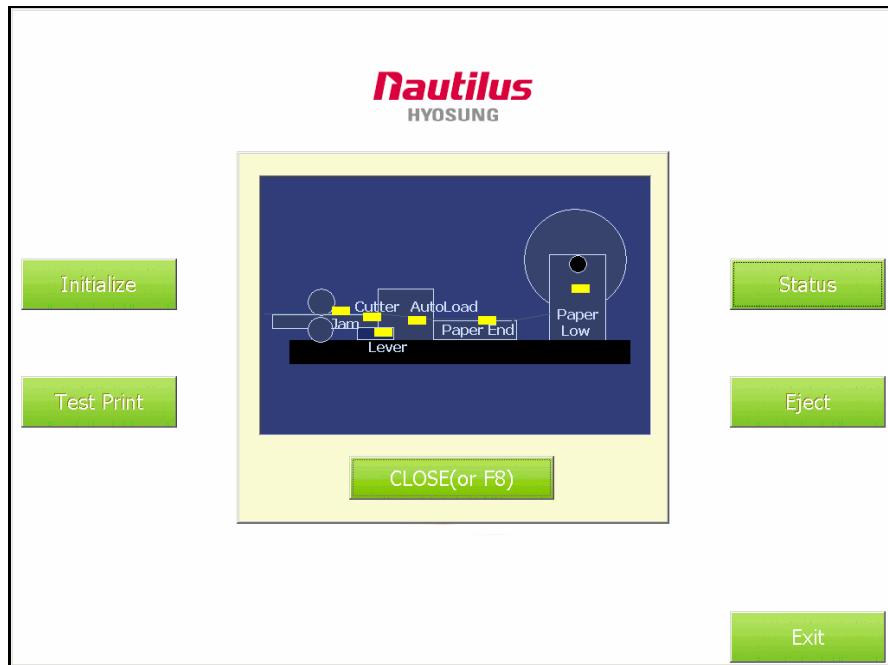
On the diagnostics menu, press the “Receipt Printer” button.



Wait until the Receipt Printer menu screen appears as shown below.



1. To initialize ReceiptPrinter, just press “Initialize”(F1) in ReceiptPrinter TEST.
2. To Status ReceiptPrinter, just press “Status” (F2) button in ReceiptPrinter TEST.  
Wait until ReceiptPrinter Status screen appears as the below picture.



Show the ReceiptPrinter Sensor position.

And It will get back ReceiptPrinter Menu Press “CLOSE(or F8)” (F8).

3. To Print ReceiptPrinter paper, just press “Test Print”(F3) in ReceiptPrinter TEST.
4. To Eject ReceiptPrinter paper, just press “Eject” (F4)in ReceiptPrinter TEST.
5. To finish ReceiptPrinter TEST, just press “Exit”(F8) in ReceiptPrinter TEST. And it will get back Main Screen.

### 8.2.5 Common Occurred Problems

- 1) Paper jams including no cutting paper
- 2) Incorrect paper loading
- 3) Print quality is bad

## 8.3 Mechanical Adjustment

When disassembling or assembling any components or assemblies in the field, it is essential to follow the proper adjustment specifications recommended by Hyosung. Performing the correct adjustment can have a critical impact on the lifespan of the component. If the adjustment is incorrect, the problem may not appear during the initial testing, but the lifespan of the component can be shortened considerably. In addition, incorrect adjustment can cause such problems such as receipt jams.

### 8.3.1 Adjustment of the Guide Inlet

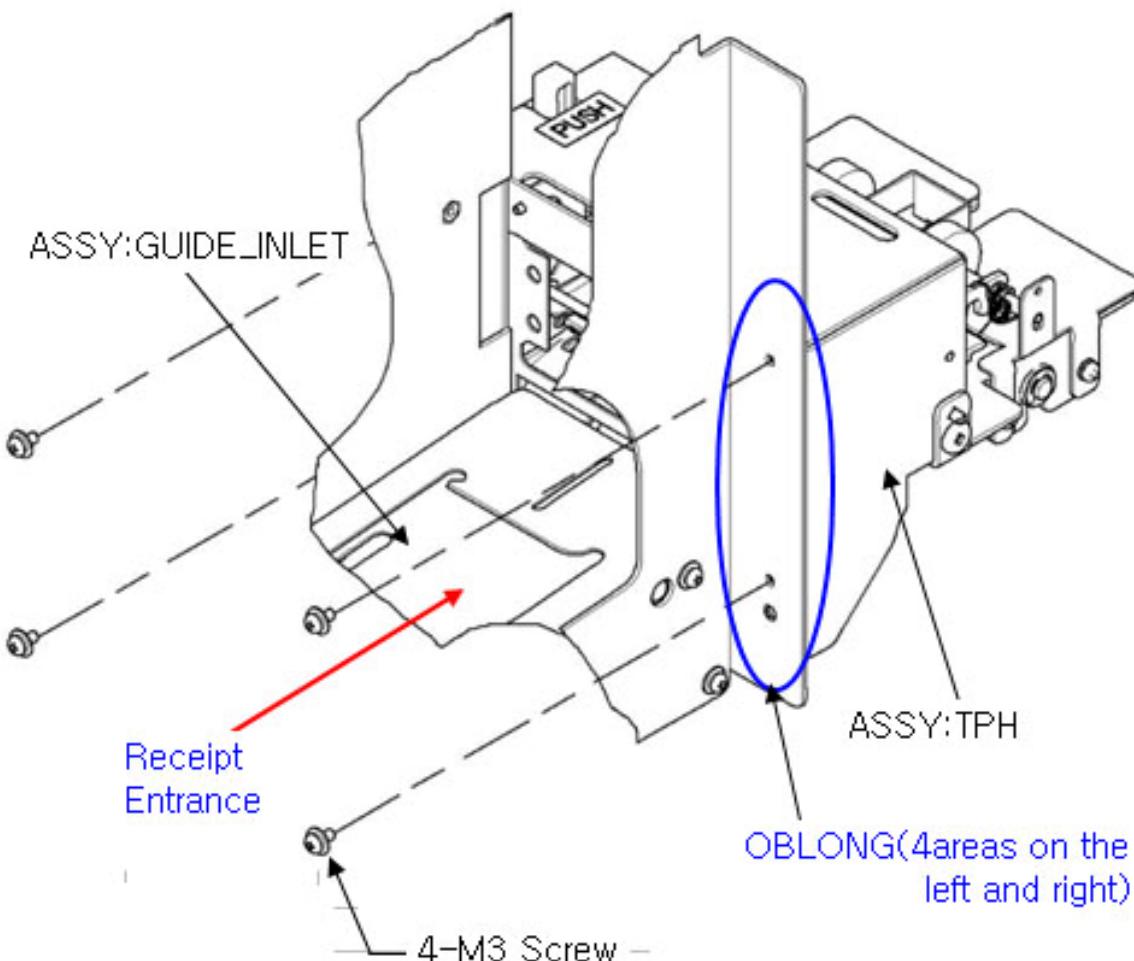


Fig. 8.4 Guide Inlet Adjustment

**MoniMax 5600****8. Receipt Printer**

Item No.	1	Adjustment Item	Assy:Guide Inlet
Adjustment Method			
<p>- Adjust the Entrance of the ASSY:GUIDE INLET and the ASSY:TPH</p> <p>1. Half tighten the four M3 Screws, and input a receipt in the direction of the arrow.</p> <p>2. If ASSY:TPH(7320000120) is tilted to one side, the receipt cannot be input. In such a case, use the OBLONG of the FRAME for the left/right adjustment of the ASSY:TPH(7320000120) and tighten the screws completely.</p>			

## 8.4 Preventive Maintenance

### 8.4.1 Cleaning

In order to prevent problems caused by the dirt or debris of the electromagnetic components on the transport path, it is important to strictly follow the cleaning cycles and methods described in this section.

#### 8.4.1.1 Description of Receipt Printer Sensors and Locations

##### 1) Sensor

Using a cotton swab or a Q-tip, eliminate foreign substances like dirt or waste. After cleaning, check the sensor by conducting a Self Test, and check at least 3 times the cleaning status, angle of the sensor, and the accuracy status of the assembly. If it is defective, replace the sensor with a new one.

Labeled Sensor	Functionality
MS1	END DETECTION SENSOR
MS2	AUTOLOAD SENSOR
MS3	JAM SENSOR
MS4	CUTTER SENSOR
MS5	TPH PLATEN SWITCH
MS6	SENSOR FOR DETECTING REMAINED PAPER (OPTION)
MS7	BLACK MARK SENSOR

##### 2) Transport path

Turn off power, and reciprocate the cleaning brush a number of times to clean the components (Roller, Cutter, etc.) on the Transport Path. Prevent static electricity occurring on the TPH print head by being careful not to touch it with your hands.

##### 3) TPH & Platen

Turn power off and open the Platen Open Lever (Green). Wipe the Heat Element and the Platen with cotton soaked in ethanol, methanol, or IPA. After the cleaning substance has evaporated, place the Platen at the normal operating position.

##### 4) Other Cautions

When transporting the Receipt Printer assembly, hold it with two hands under the printer. Do not

hold the print release section of the assembly. For repairing the Receipt Printer, do not forget to place it on the flat surface. There must be no shaking or interventions from other objects.

#### **8.4.1.2 PM (Preventative Maintenance) During Repair Calls**

- 1) Perform the following steps, after you have made repairs or cleared paper jams.
- 2) Remove all accumulations of dust and paper residue from the unit using a brush and cleaning rag. Any debris left may be blown away using canned air. Make sure that you clean the surfaces of every sensor on the SPR by using foam or cotton tips. Any cracked or broken sensors must be replaced.
- 3) Open the Print head assembly and using canned air, blowout any dust or debris inside this area.
- 4) Ensure that all transport belts are in the correct pulley position. If belts continuously get out of place, this is a good indication of wear and the module needs to be replaced.
- 5) Ensure printing records are printed clear and legible.
- 6) After you have repaired and performed your PM, it is imperative that you run diagnostics to fully test the unit.
- 7) Fill out the ATM Repair Log Sheet

#### **8.4.1.3 PM Every 3 Months or 20,000 Transactions**

- 1) Perform steps 1 – 7 of the SPR Preventative Maintenance during repair calls.

### 8.4.2 Lubrication

- Check the oiling status before running or storing the receipt printer. If needed, apply lubricant to the corresponding part in compliance with the oiling standard.
- Apply grease only if necessary during the regular field inspection. If there is enough lubricant, do not apply additional lubricant. However, if lubricant is contaminated, remove the old lubricant before applying new.
- All pivot points and frictions parts must be oiled.
- All points except the following must be oiled:  
Printing head, Magnetic head, Package, Micro switch contact, Drive roller, Timing pulley, and Timing belt
- All oiling operations must be based on oil drop unit. However, when contact between the oiling device and the oiling target is unavoidable, the contact time must not exceed one second.

**[NOTE!]**

- Lubricant must not leak. In other words, lubricant must be applied only to the parts that need oiling. Do not apply excessive lubricant. Lubricant must not contaminate other parts. Be careful that the micro switch, sensors, the timing pulley, the timing belt, the controller board, the print head, and the magnetic head are protected from lubricant.
- Do not clean plastic parts or protection devices with alcohol and other agents other than the designated one.
- Remove dust, oil, and grease from the assembly and clean with a dry soft cloth.
- Be careful that the paper contact areas in the paper return path is protected from lubricant.
- Lubricant Types

Description	Represented with Letter
Shell Grease Alvania EP (Small container)	“B”
Shell Oil Tellus #100	“C”

### 8.4.3 Lubrication Point

#### 8.4.3.1 SPR Preventative Maintenance Every 6 Months or 40,000 Transactions

1) Support engineering recommends that the SPR gets lubricated every 6 months. All lubrication points illustrated must be checked and lubricated if necessary. Before you apply any type of lubricant, it is imperative to wipe off any of the old lubricant left on the assembly. The SPR does not require much lubrication. There are only 2 types of lubricants designated to be used in this assembly and they should be applied on specific locations illustrated on the following images.

#### [NOTE!]

Greasing: When applying grease, it is CRUCIAL to clean and apply a very light amount on the designated areas, especially gears.

Oiling: It is imperative to clean the components first and then apply a very light amount of oil.

AREAS NOT SPECIFIED IN THIS DOCUMENT, DOES NOT REQUIRE LUBRICATION.

MAKE SURE Belts, Printhead, Micro Switches, Timing Gears and Drive Rollers IN THE SPR ARE "NOT" CONTAMINATED WITH ANY LUBRICANT. THIS MAY DAMAGE OR CHANGE THE FUNCTIONALITY OF THE COMPONENT.

**1) GEAR**

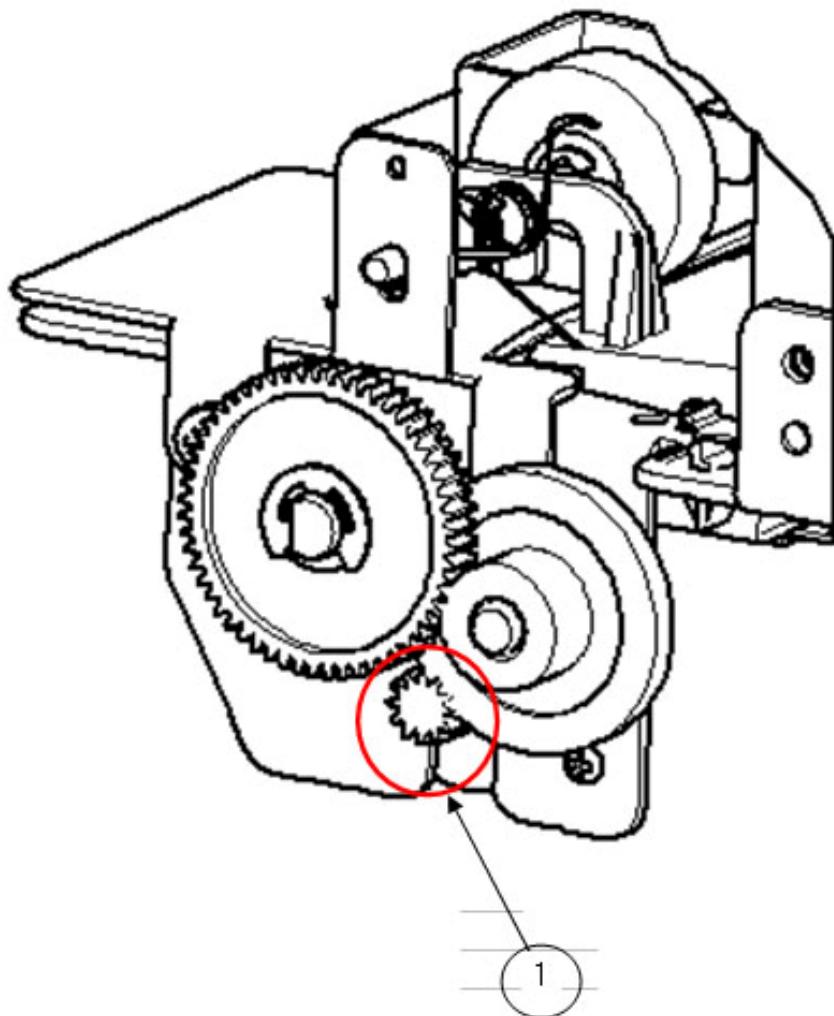


Fig. 8.5 Lubrication point 1

**2) SPRING HOOK**

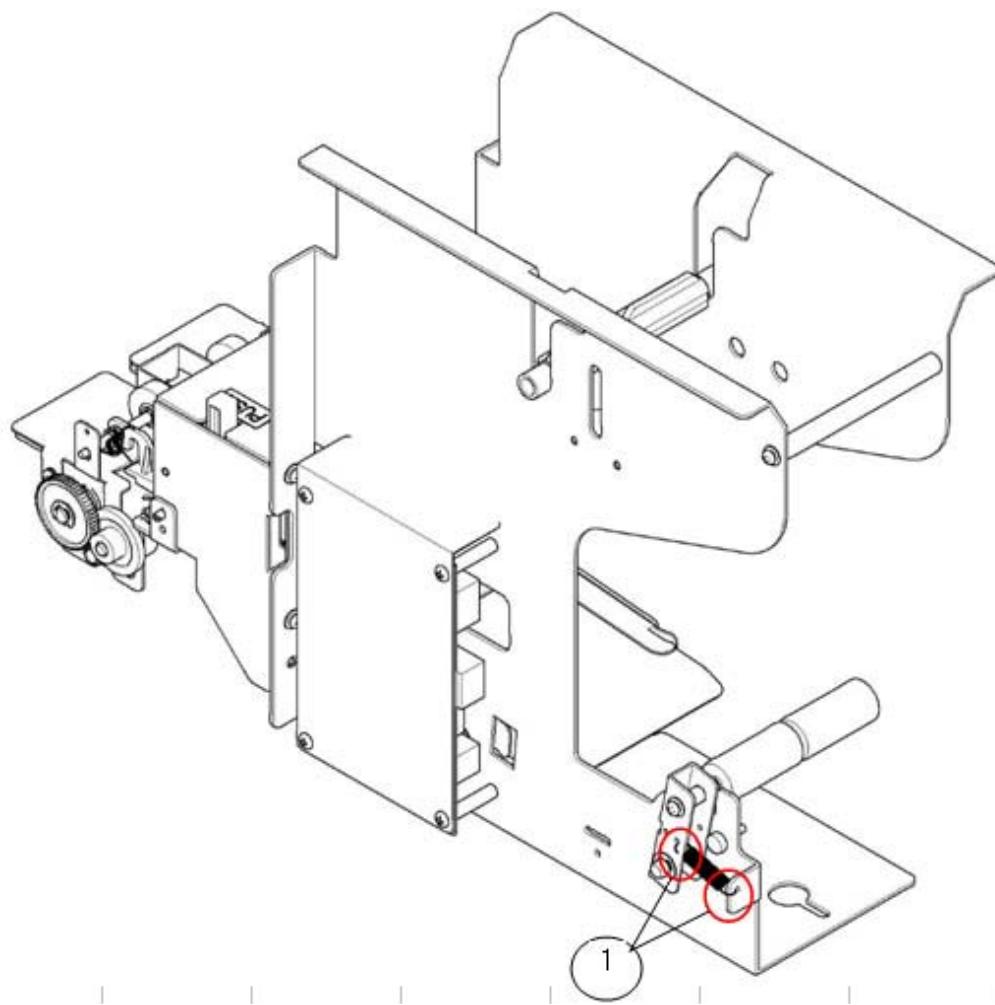


Fig. 8.6 Lubrication Point 2

## 8.5 Removal/Installation Procedure

There are several parts or assemblies that can be replaced in the field. In order to repair other components, the entire receipt printer should be replaced at the Depot level. Note however, that this is just a recommendation and can be adjusted depending on field conditions or the capability of the technician.

SECTION	LOCATION DETAIL	REMARK
Entire Unit	Receipt Printer	Field technician Level
Sensor	MS1, MS3	
Controller Board		
Motor		
Outlet guide		
Other components not mentioned above		Depot Level

### 8.5.1 Entire Unit Replacement

- 1) Open the front door and turn off the system power.
- 2) Pull the rail assembly out with the Receipt Print assembly and remove the Receipt Roll.

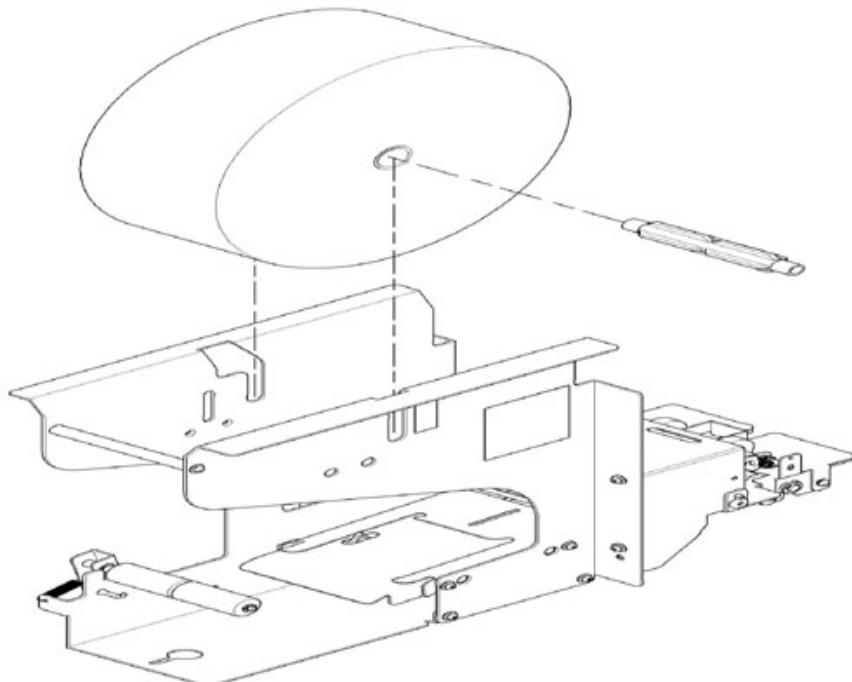


Fig. 8.7 Entire unit replacement procedure 1

- 3) Disconnect the USB and the Power Cable.
- 4) Loosen 1 screw at the back and pull the receipt printer as shown below to remove the entire Receipt Printer assembly.

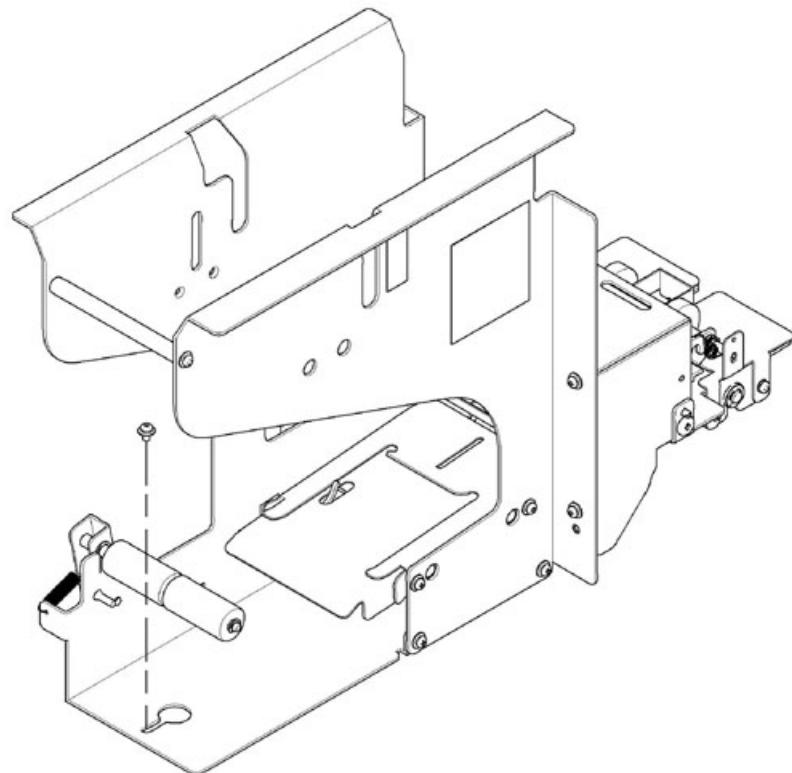


Fig. 8.8 Entire unit replacement procedure 2

### 8.5.2 How to easily take apart the Assembly

For repair of the assembly, it is easy to disassemble the printer into 3 assemblies as shown below,

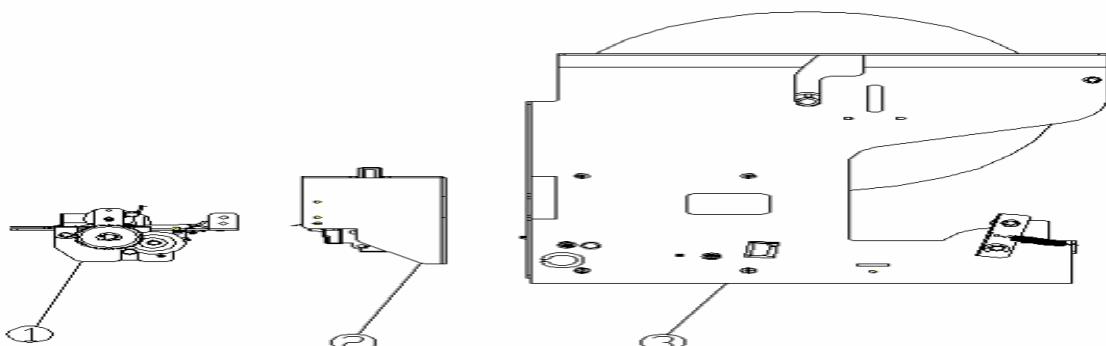


Fig.8.9 How to easily take apart the Assembly 1

## MoniMax 5600

## 8. Receipt Printer

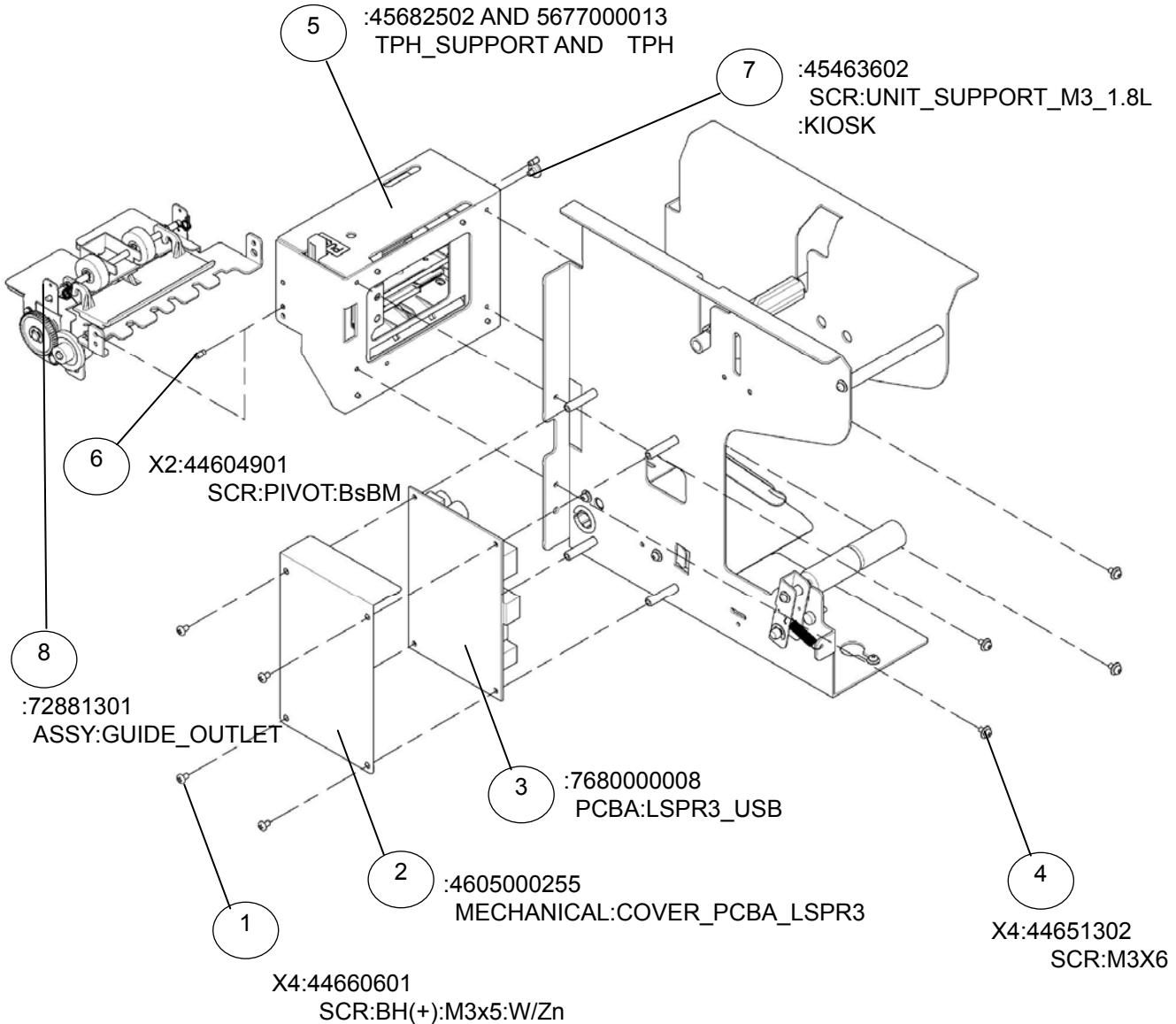


Fig. 8.10 How to easily take apart the Assembly 2

- 1) Remove cover and PCBA by unscrewing ① screw (44660601).
- 2) Disassemble connectors connected to PCBA.
- 3) Disassemble TPH\_SUPPORT from the receipt printer by unscrewing ④ screw (44651302).
- 4) Separate TPH\_SUPPORT and ASSY:GUIDE OUTLET by unscrewing ⑥ and ⑦ screws.

### 8.5.3 Sensor Replacement

#### 1) MS1 Sensor

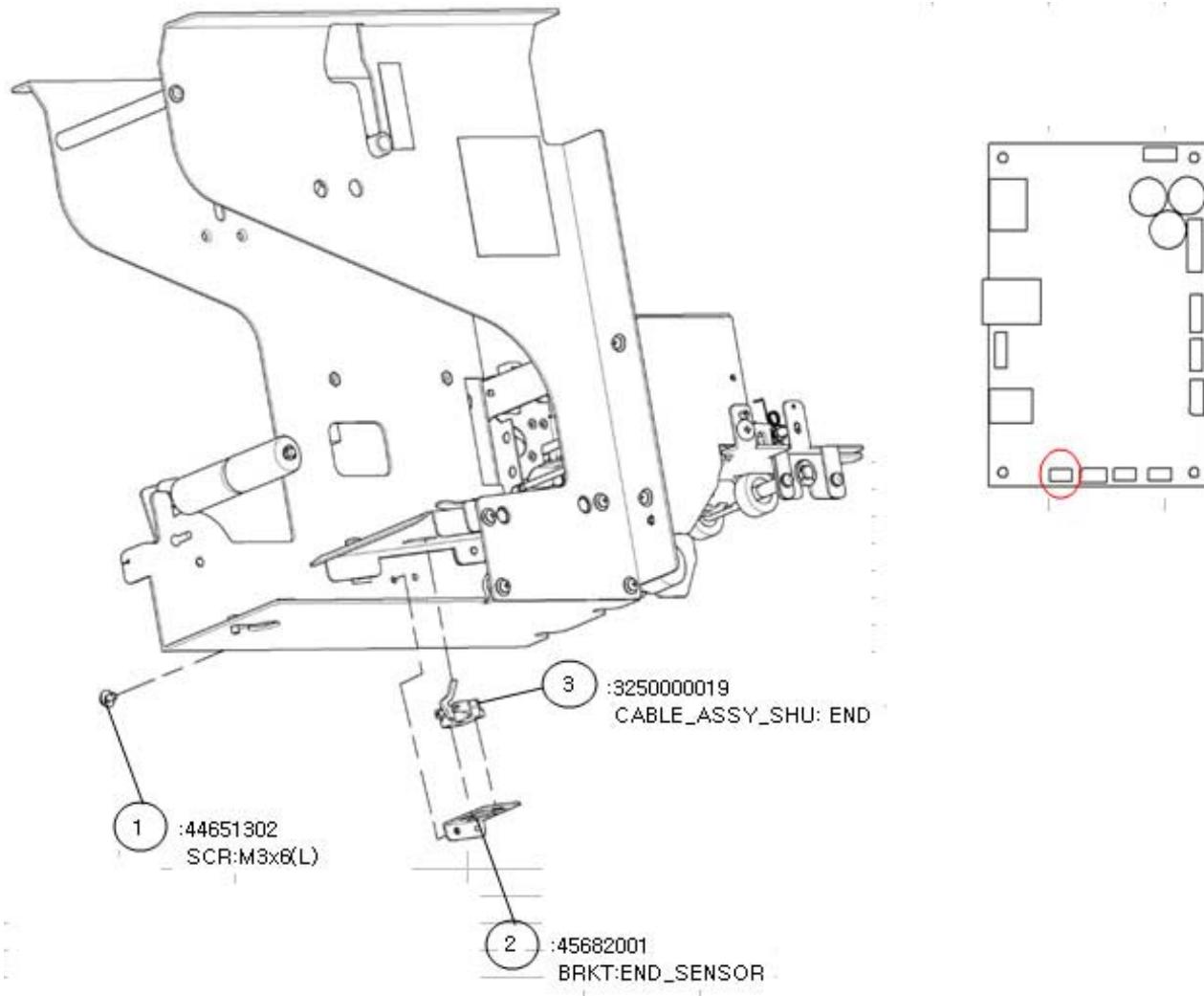


Fig. 8.11 Sensor Replacement 3

- 1) Disassemble PCBA and CONNECTOR.
- 2) After removing ① screw, disconnect BRKT(②) and CABLE ASSY(③).
- 3) Replace CABLE\_ASSY as new one.

2) MS3 Sensor

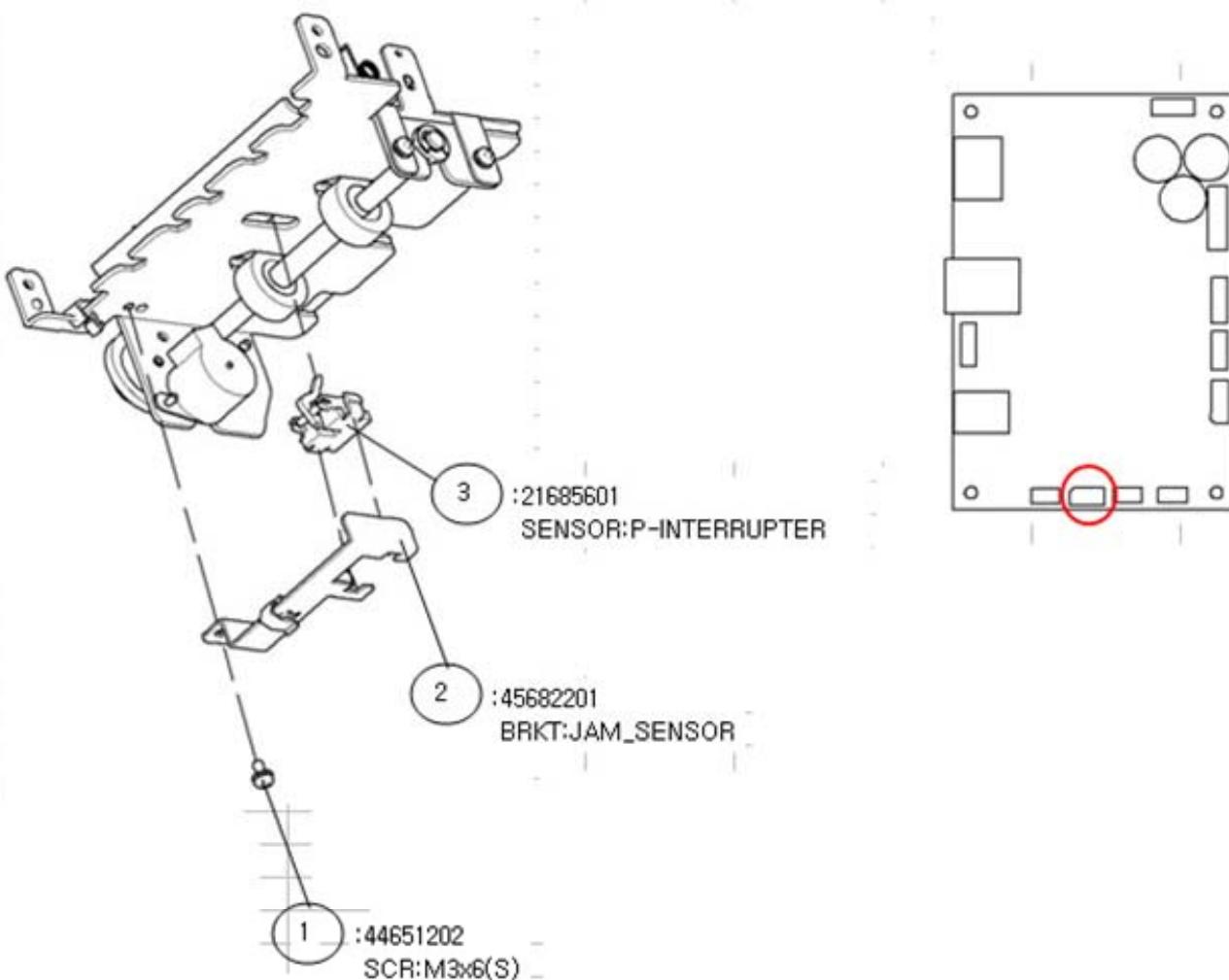


Fig. 8.12 Sensor Replacement 4

- 1) Disconnect cable connector from PCBA.
- 2) Remove ① screw.
- 3) Disconnect BRKT:JAM\_SENSOR and SENSOR:P-INTERRUPTER.
- 4) Replace sensor as new one.

### 8.5.4 Sub-assembly Replacement

#### 1) Thermal Printing Head

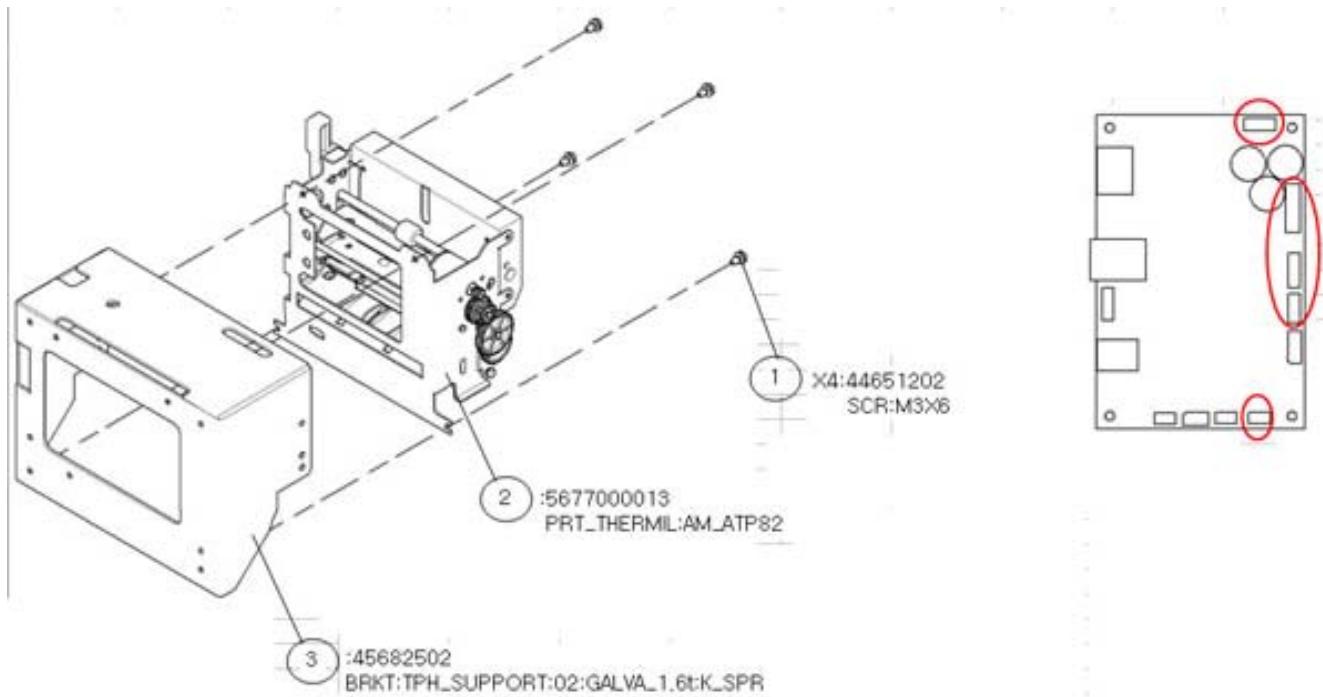


Fig. 8.13 Sub-assembly Replacement 1

When taking out the Print Head, be careful not to damage the FFC Cable. Make note of the cable orientation on the PCB before disconnecting. Match the Pin configuration when re-assembling the FFC Cable to the Control Board.

[Note]

Insert HEAD OPEN LEVER into the interference evacuation zone when assembling TPH and TPH\_SUPPORT.

**[WARNING!]**

Since the FFC Cable has different voltages (+3.3V, +5V, +12V, +24V) connected together, it is very important to match the correct Pin configuration when re-assembling a cable to the connector. Damage to the control board can occur if the cables are not connected properly.

**2) Outlet Guide Replacement**

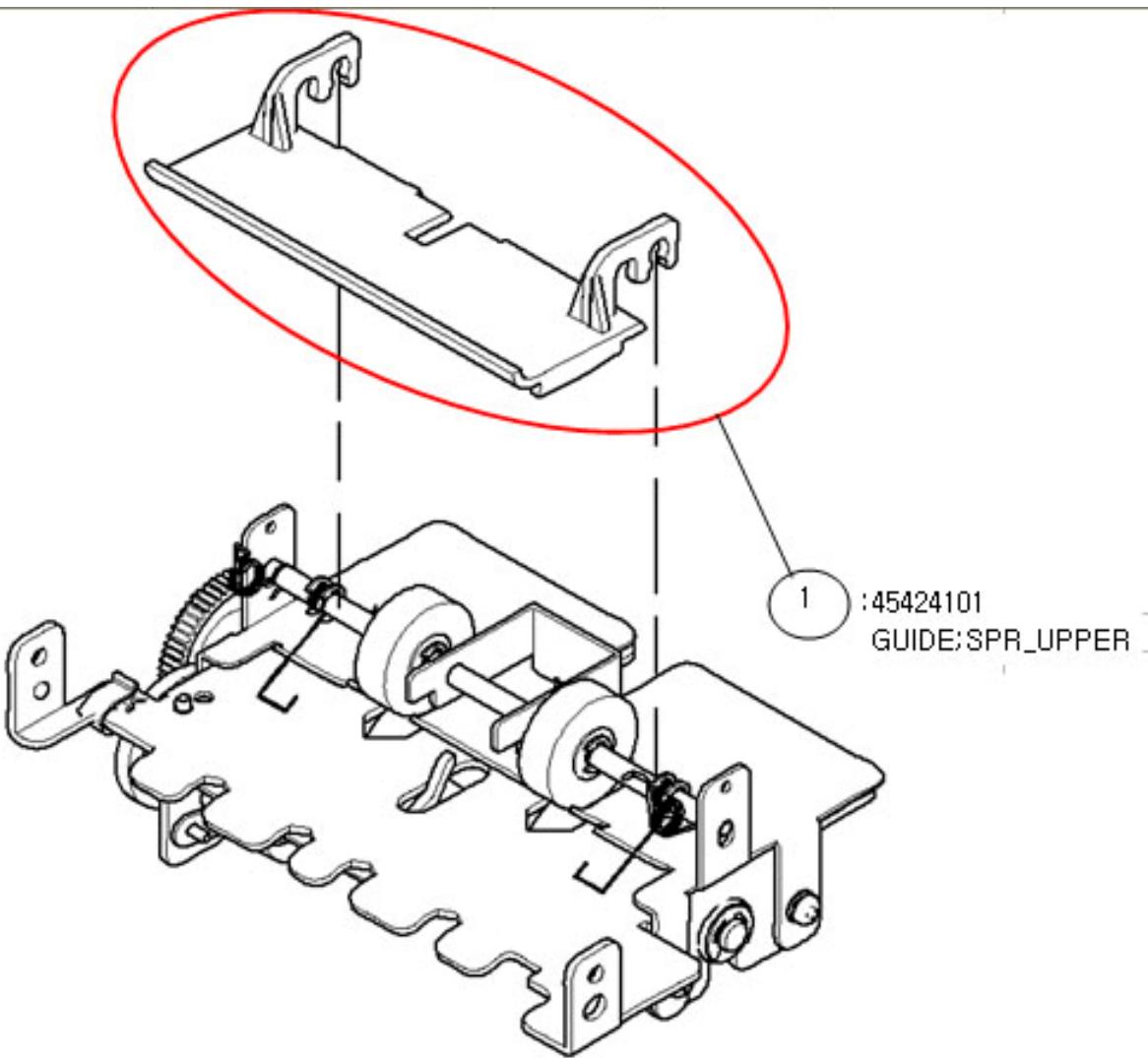


Fig. 8.14 Sub-assembly Replacement 2

- 1) Pull up the spring, take out the Guides and replace them (Refer to VIEW "A").

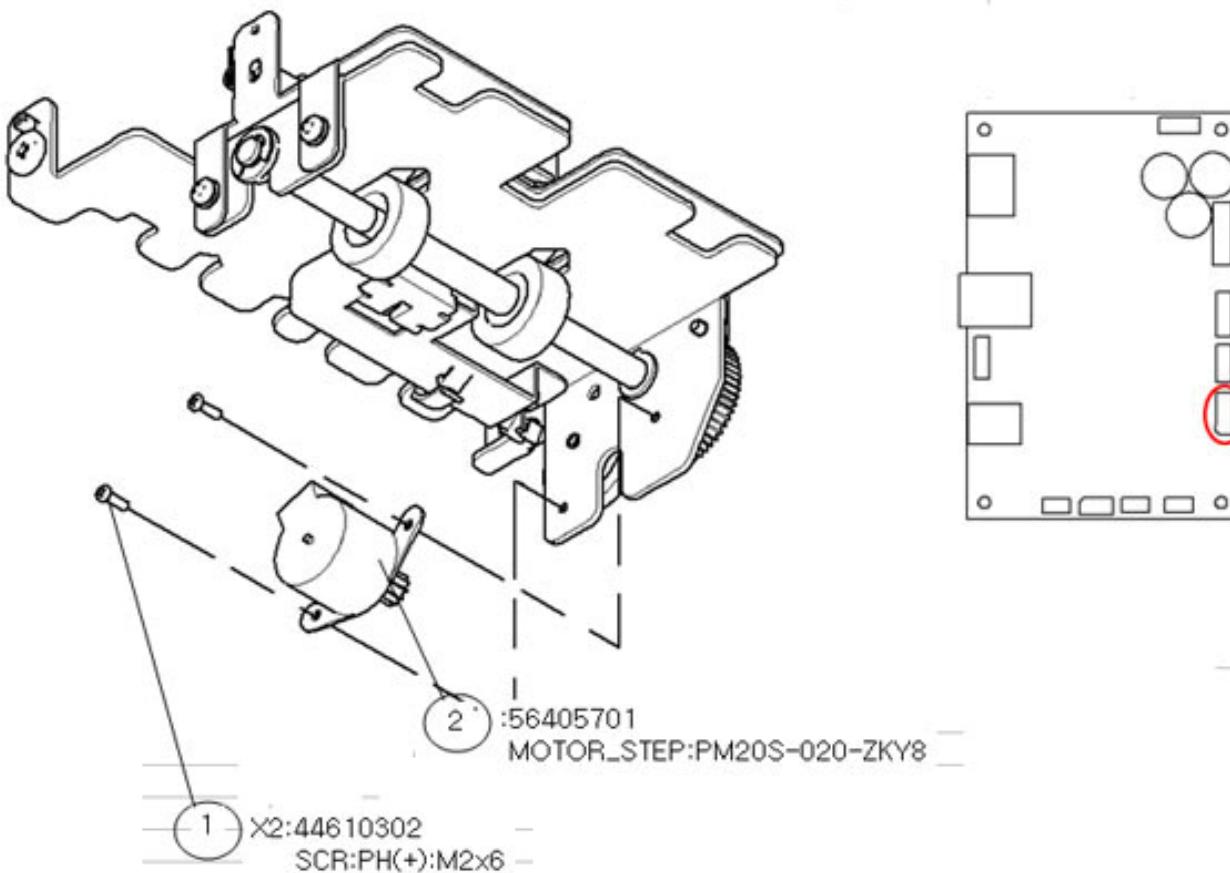
**3) MOTOR Replacement**

Fig. 8.15 Sub-assembly Replacement 3

- 1) Separate motor connector from PCBA.
- 2) Unscrew ① screw (44610302) and disassemble motor (56405701).
- 3) Replace motor as new one.

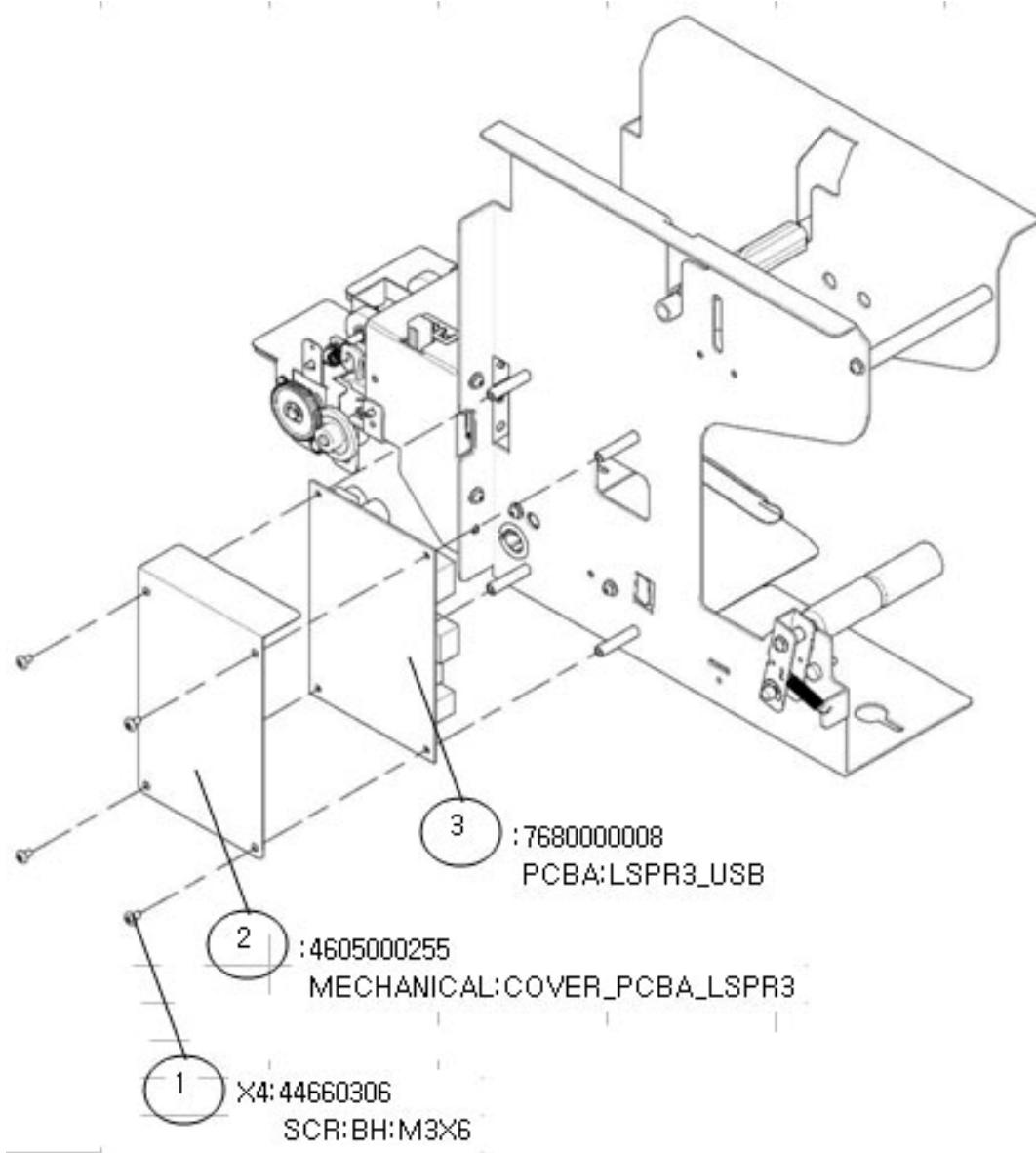
**4) Control Board**

Fig. 8.16 Sub-assembly Replacement 4

- 1) After removing ① screw and cover, disassemble PCBA from receipt printer.
- 2) Separate all connectors connected to PCBA.
- 3) Replace PCBA as new one.

**MoniMax 5600**

**9. Journal Printer**

## **Chapter 9. Journal Printer**

## 9.1 MDP350 (Dot Matrix Journal Printer)

### 9.1.1 Introduction

#### Basic Features

This section will describe the rolls of each main part for DOT JPR.

#### Schematics of Memory

A	Flash Memory	4Mb, 16Mb (MASK ROM : 16Mb)
B	RAM	4Mb
C	Usable Memory Space	512Kbyte with 2Mbyte of extension memory



#### PRODUCTION INFORM :

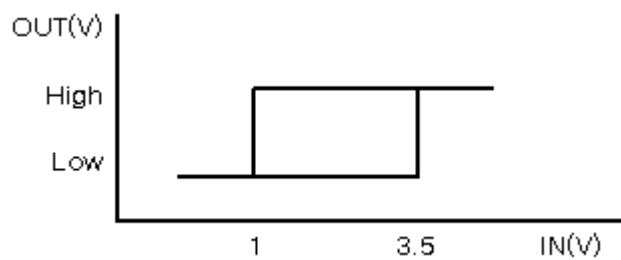
Memory space between “00000H-08000H” is reserved for CPU SFR and RAM by CPU.

#### Sensor Ports

To dispatching the noises on 1<sup>st</sup> signal entrance level, we are installing “RC Low Path Filter”.

Hysteresis distinctive by OP AMP is used for Secondary noise Filter to granteer stability activation.

Based on 1V~3.5V of input range, Hysteresis distinctive is entitled to activate.



#### Paper Detection Sensor

Paper detection sensor which is installed at step back side from **DOT Header** and can detect paper Position whether it correct or not.

**MoniMax 5600****9. Journal Printer**

If there have no paper on paper tray (Indicate Signal = High), turn on the **PAPER OUT LED**.

This function is not related to Printing but report to host paper out warning.

If 19mm of inner diameters were used for paper roll, near end sensor will detect paper out when the paper roll becomes 30mm diameter and amount of paper remaining is 3-4M.

**Carriage Home Sensor**

Will detect position of carriage

If the carriage can't return to default position according to Paper Jam or mechanical problem, this sensor will detect (Indicate signal = Low) and displaying **Error LED**.

**Power Control**

Power controller conducting DC regulation from 24VDC input source to +5VDC range to drive internal Logic.

---

<b>A</b>	+24VDC	DOT HEAD, ROLL and Line Feed, Carriage Motor
<b>B</b>	+5VDC	CPU, Buffers

---

**PRODUCTION INFORM :**

Power usage : +24V (2.0A) / +5V (700mA)

**LED / KEY PARTS**

Each LED is activated by transistor (UMD3M)

3 colors of LEDs are indicating for POWER (Green), PAPER OUT (YELLOW) and ERROR (RED).

2 Keys are available to proceeding Line Feeding, Backward Feeding, Version Printing, and Character Printing for diagnostic.

---

<b>A</b>	BACK FEED Button	Paper backward feeding
<b>B</b>	BACK FEED Button + Unit Power ON	Printing Font and Characters from Font ROM.

---

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<b>C</b>	FEED Button	Paper Forward Feeding
<b>D</b>	FEED Button + Unit Power ON	Printing Unit Configuration, ROM Version and Test Pattern

---

**DOT HEADER**

To grantee the stability of transferred data, **COMS(HCO5)** and **STA471A Solenoid Driver** is used.  
In additional, Timer control on +5VDC level will complement stability of DOT Header.

**Carriage Motor / Line Feed Motor Control**

Through a pair of rated currents the Drive PM Stepping Motor is handled.

For the accuracy of Motor driving Driver IC (UDN2916B) is using.

Capacity of the power for this Driver IC is 1A Peak and 350mA for the Motor.

**Paper Roll Motor**

To perform Paper winding, DC Motor is used for this part and for the driver TR (2SD2143) is installed.

Capacity of the power for Driver TR is 2A Peak and 400mA for the Motor.

**Detecting Header Temperature**

Heat detection on Header is one of key function on Printer to prevent malfunction or header damage.

**ADC sensor** is detecting header temperature by variable range of voltage which is affected from  
The variables register range on Dot Header Thermistor.

This detection sensor is purposed to make Printer stop when header's temperature become 120°C.

If there has no Heat detection function Header can be burned out.

When over heating is detected, Printer will stop with Error LED and idle status will steady until  
temperature turned down to 90°C.

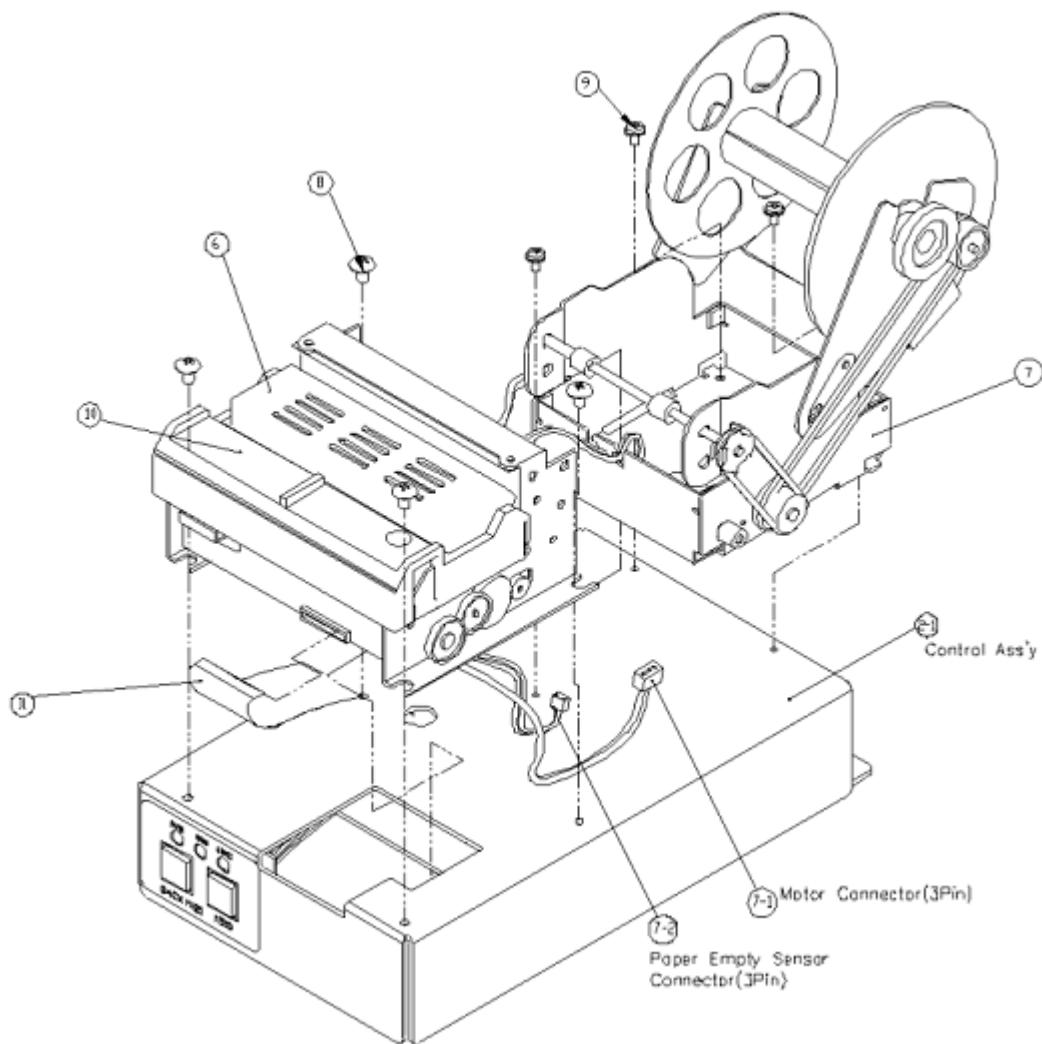
**Serial Communication**

RS-232C Serial is required to communicate with Control PC.

At the least 4 signal pins (TXD, RXD, RTS, CTS) need to configure RS-232C.

4,800 bps ~ 38,400 bps of line speed is available and user selectable.

### 9.1.2 Disassembly & Reassembly

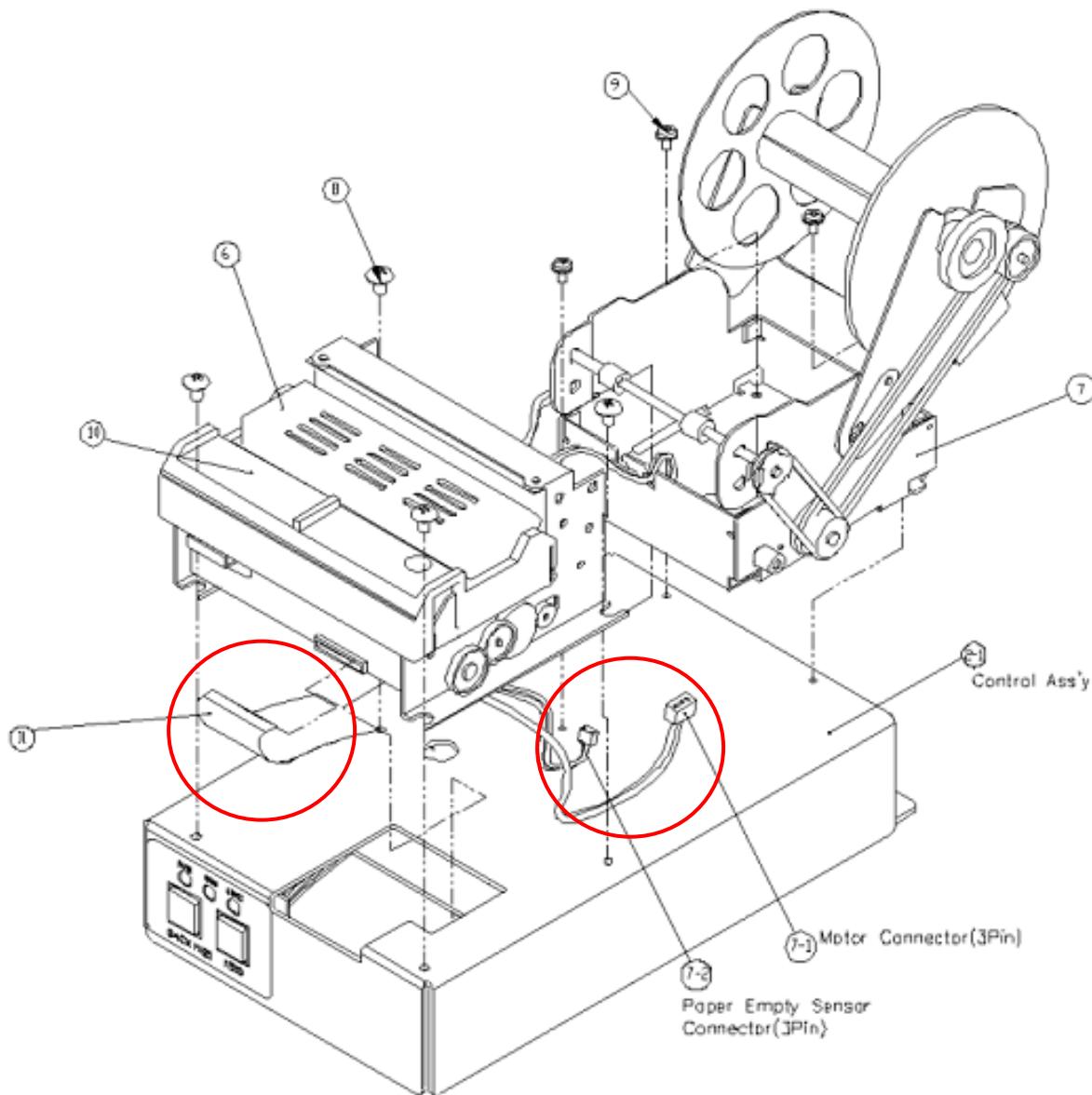


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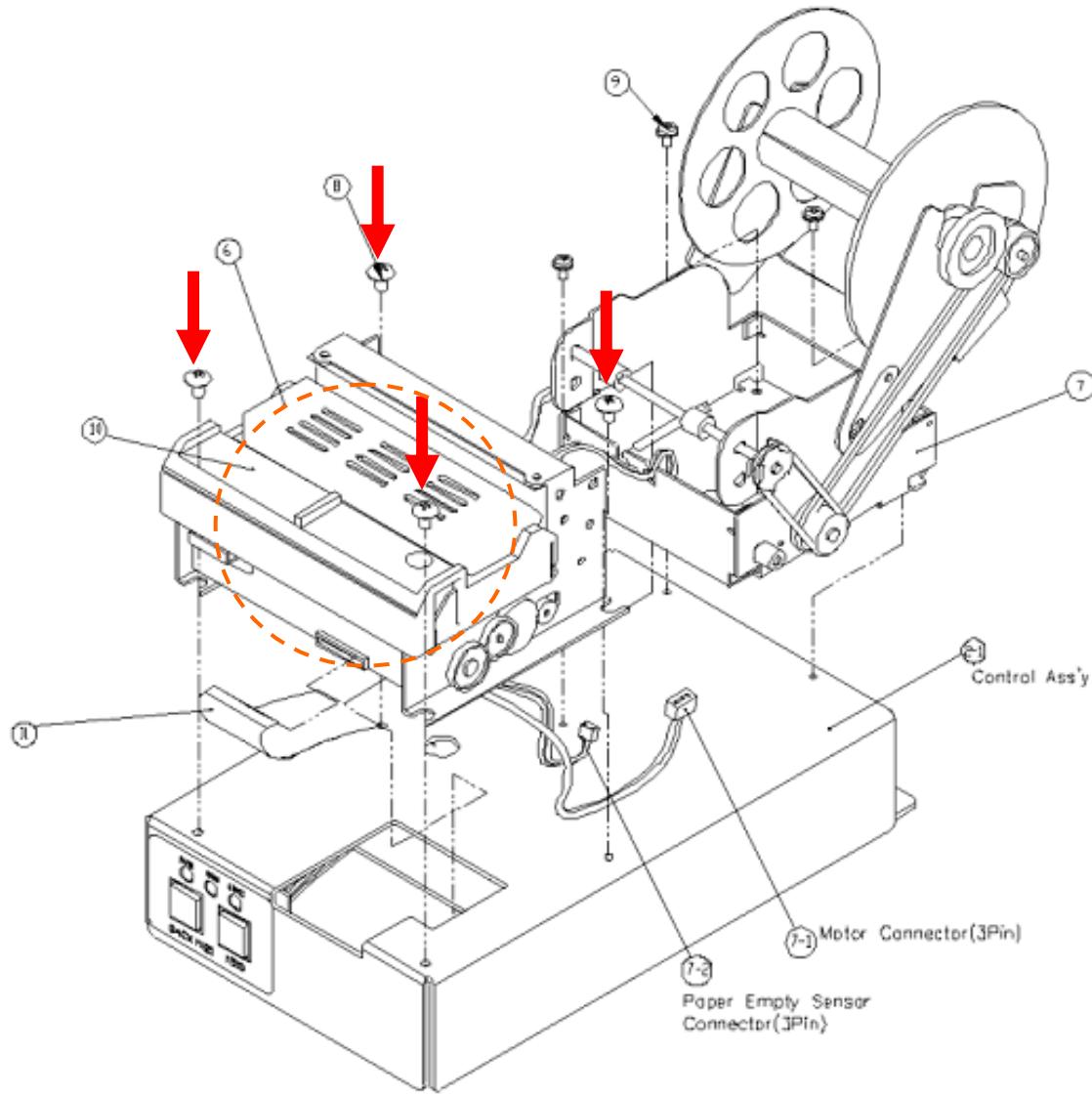
9. Journal Printer

**DISASSEMBLY**

**Printer Module & Paper Holder**



- Unplug 7-1, 7-2 Connector from Control Board
- Unplug 11 FFC Cable from Control Board

**MoniMax 5600****9. Journal Printer**

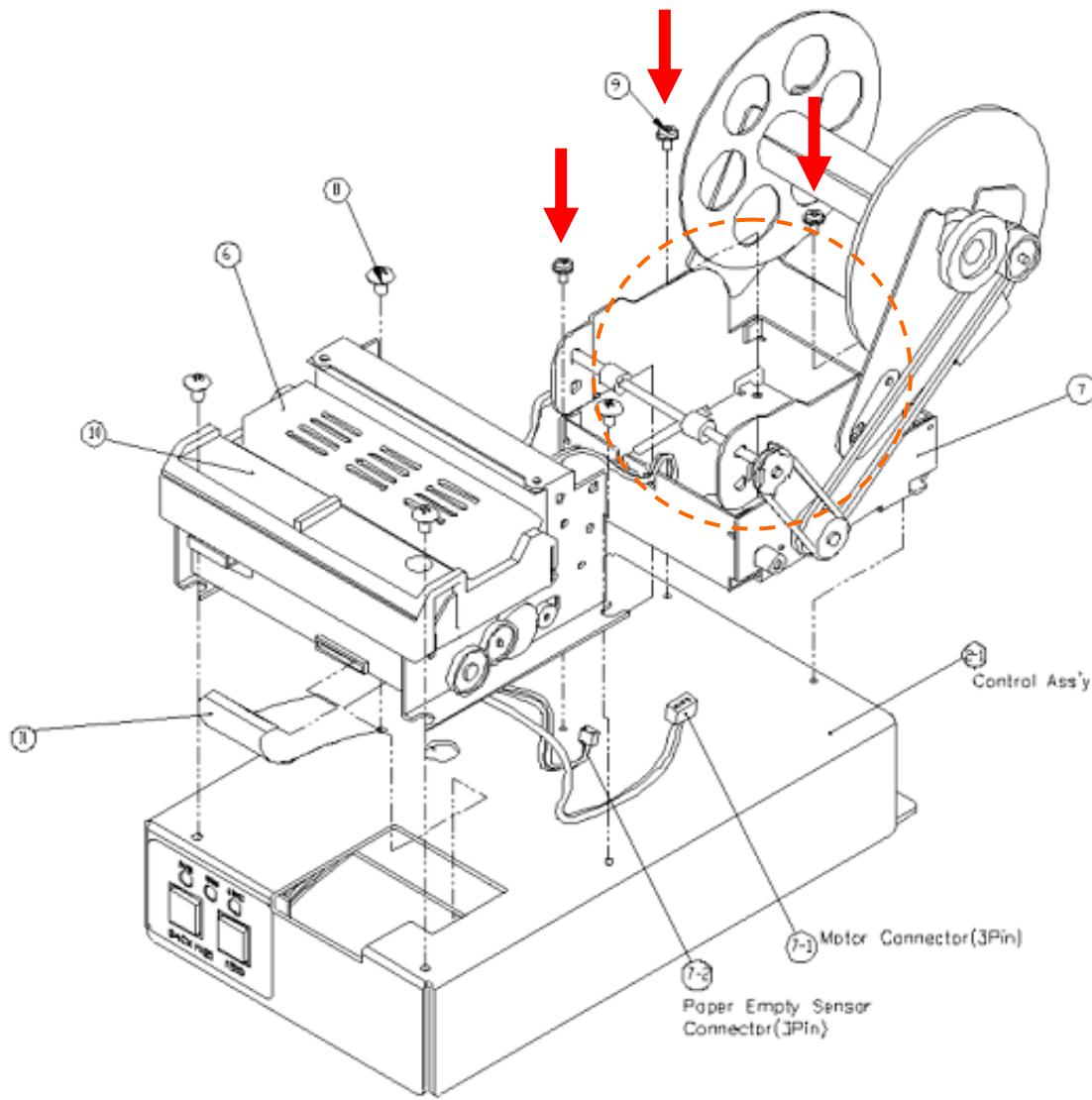
- Un-Screwing ⑧M4 (X4 EA)
- Take out DOT Printing Header ⑥ from Unit.

**PRODUCTION INFORM :**

Please Keep out each screws disassembled, Screws have to be used for reassemble.  
No more lower level of disassemble is permitted for DOT Header.

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- Un-Screwing ⑨M3 (X3 EA)
- Take out Winder Module ⑦ from Unit.

**PRODUCTION INFORM :**

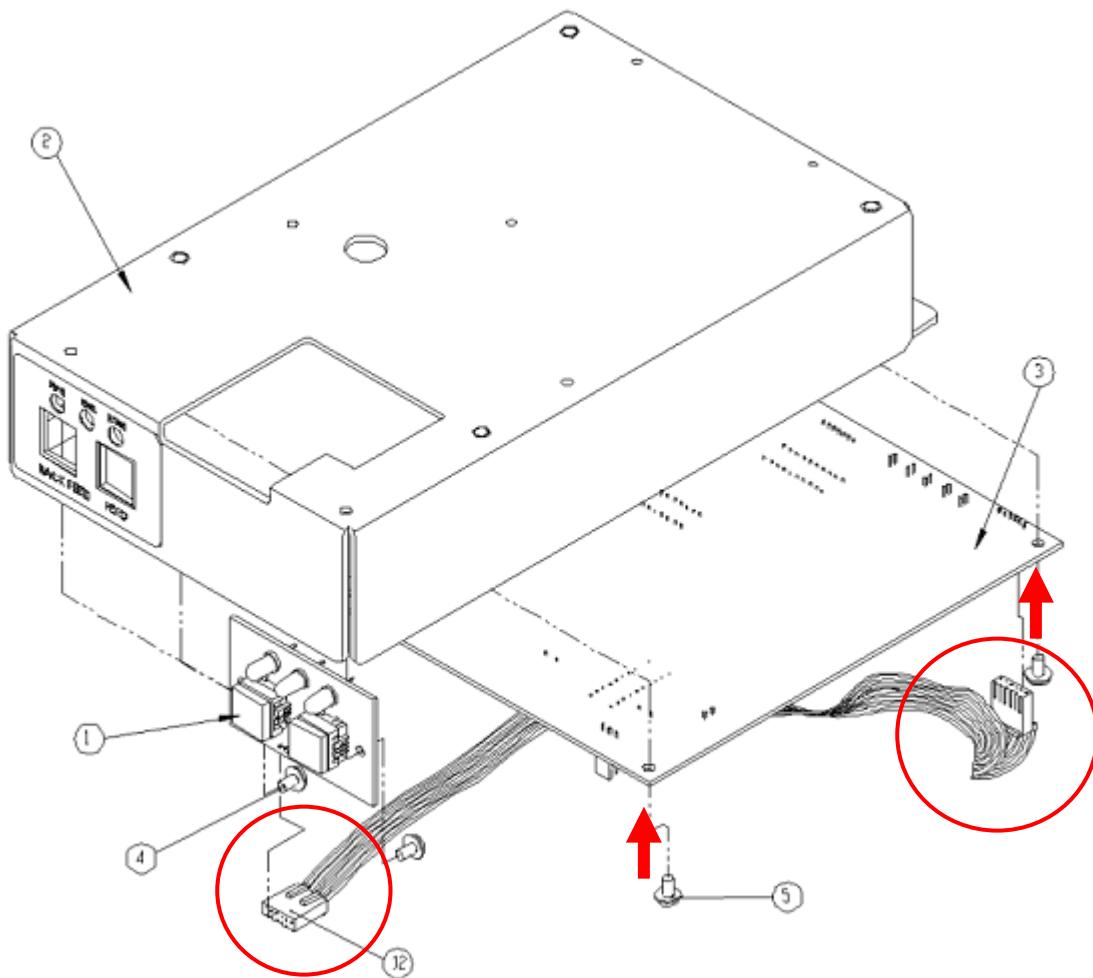


Winder has 2 Types of Power belt

If you need to exchange this, remind that belt direction and it's position either..

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**9. Journal Printer**

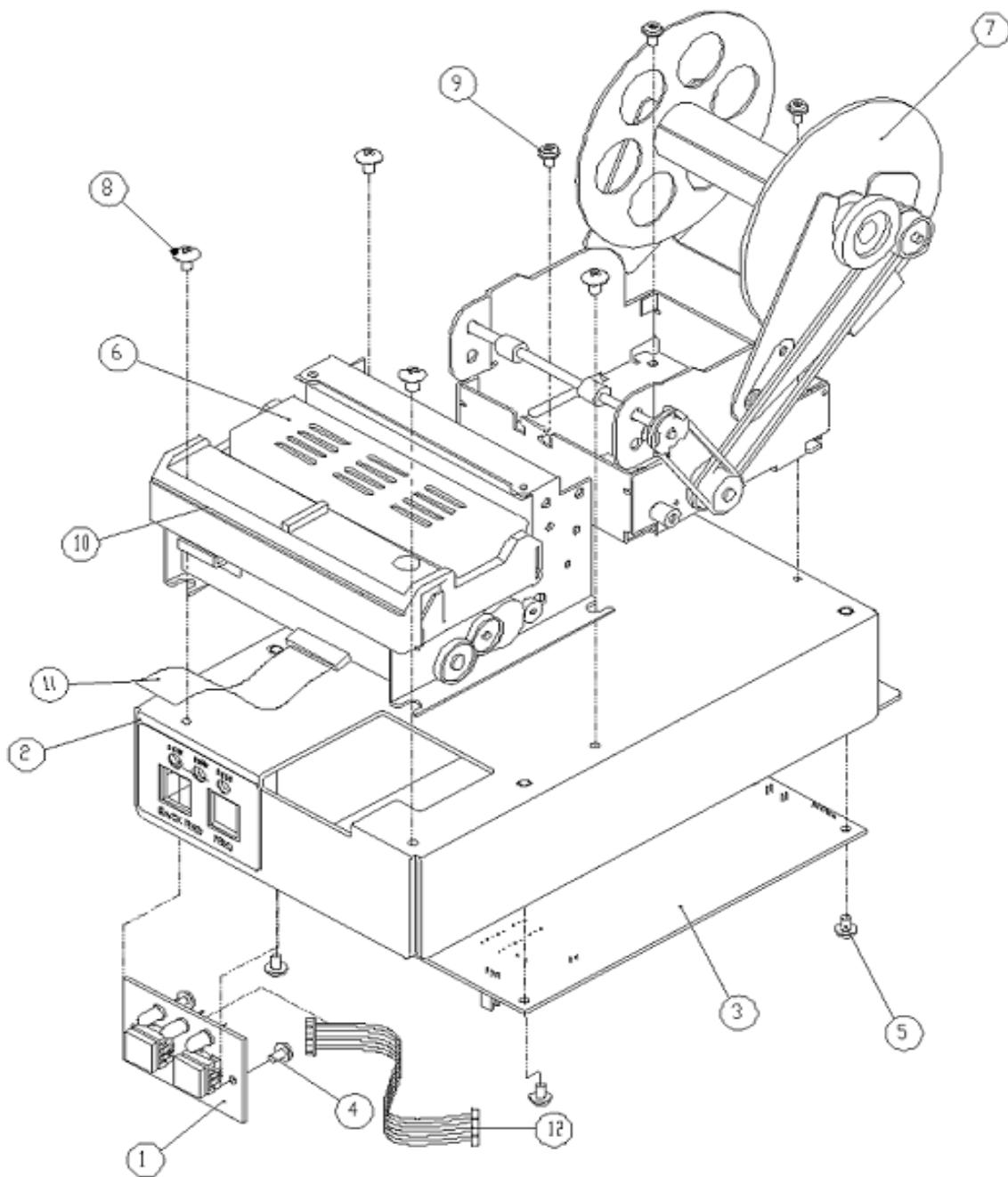


- To Take out Printer Main Board, first disconnecting Switch cables ⑫
- Un-Screwing M3 ⑤ X 4EA and takeout main board carefully from Printer Case Box ②
- Un-Screwing M3 ④ X 2EA and takeout Key Button board from Printer Case Box ②

**MoniMax 5600**

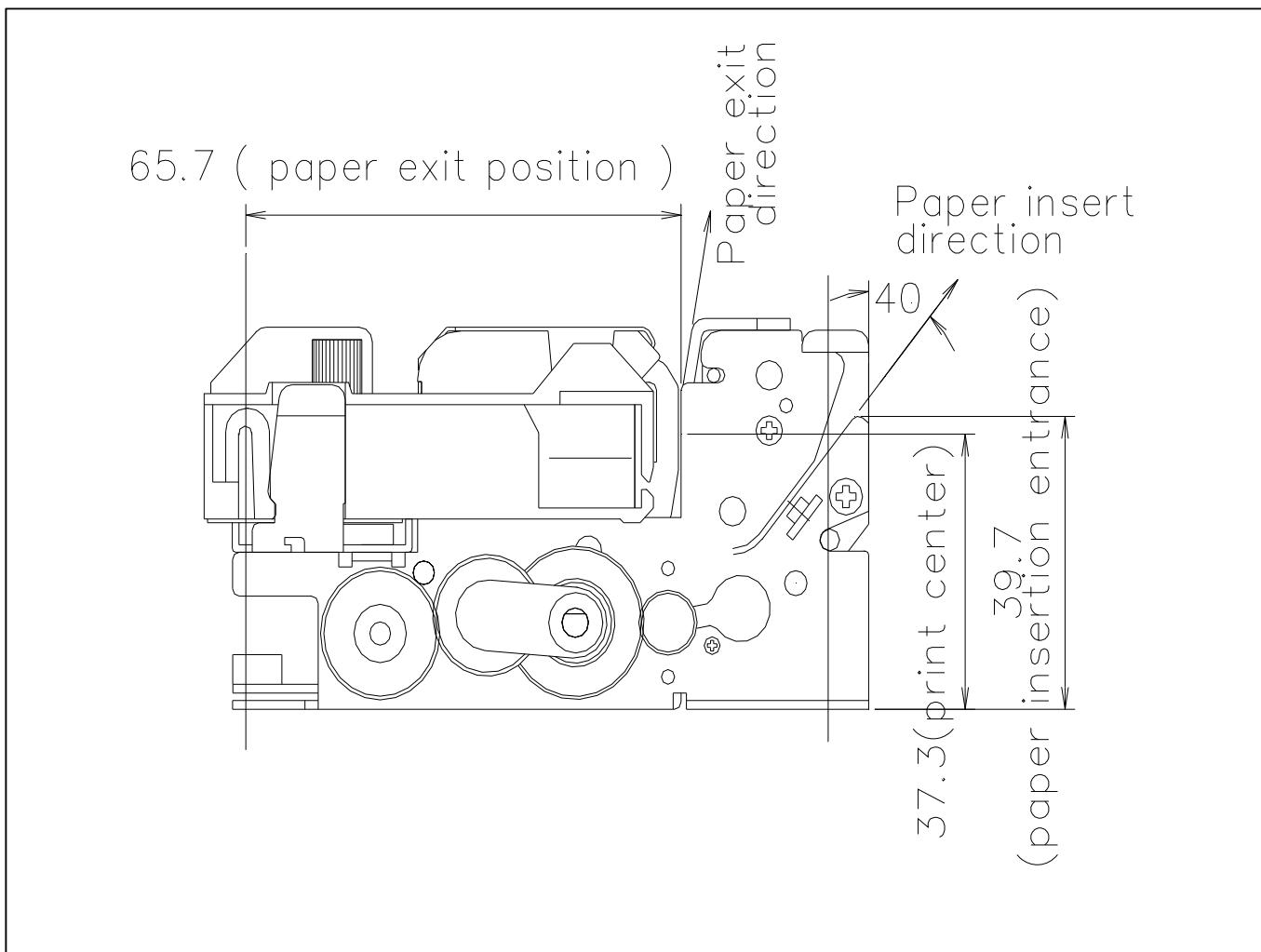
**9. Journal Printer**

**Exploded View**



### 9.1.3 Trouble Shooting

#### *Paper Setting*



Using regular paper for Printer is required.

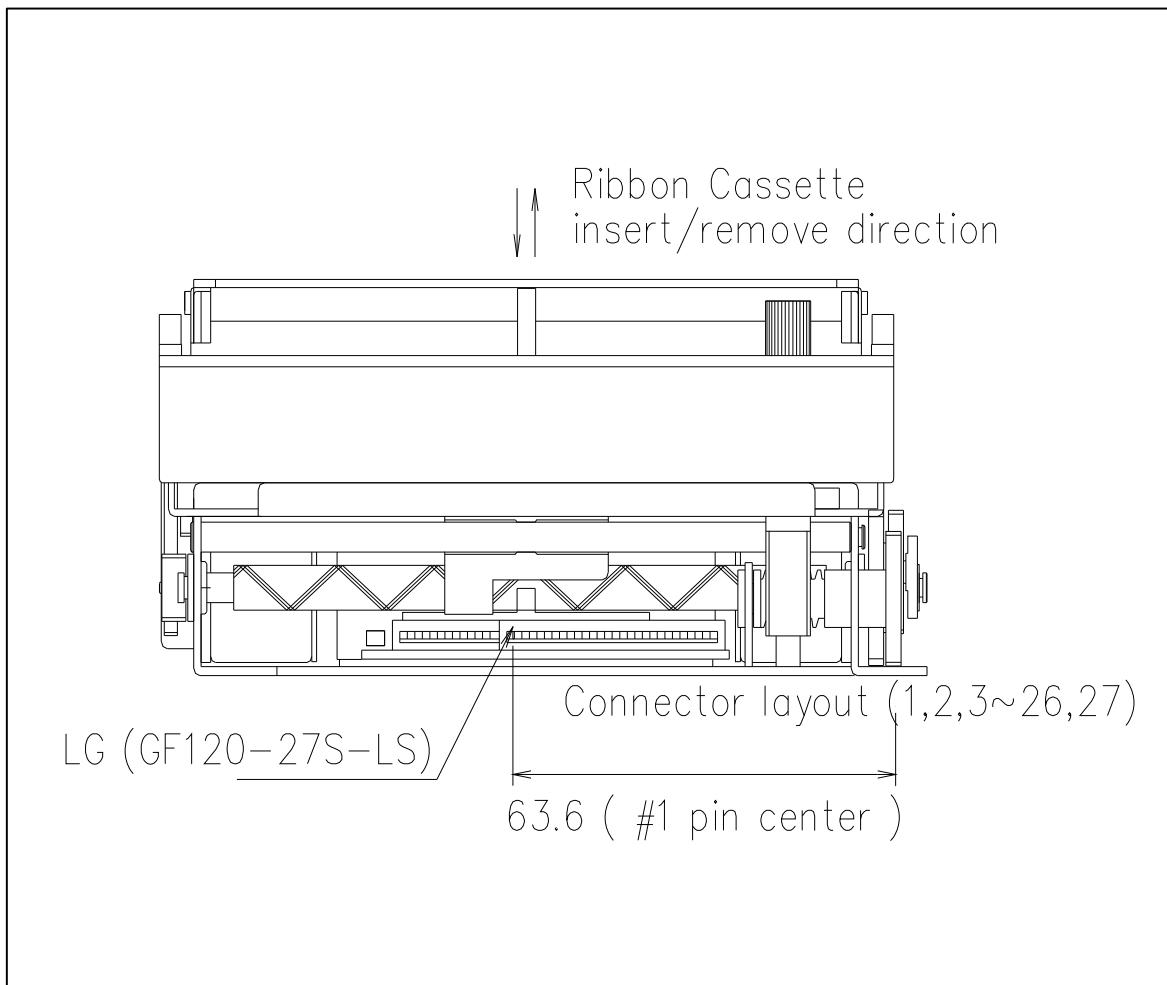
When Paper detection sensor detects the paper from paper path, Line feed motor will loading paper 150mm out through the paper exit direction.

#### ***Clear Jam***

One of simple idea to clear Jam is preceding reverse sequence as paper loading.

After cutting off the paper between Paper winder and Paper insertion direction, take out paper to paper insert direction.

**Ribbon Install**



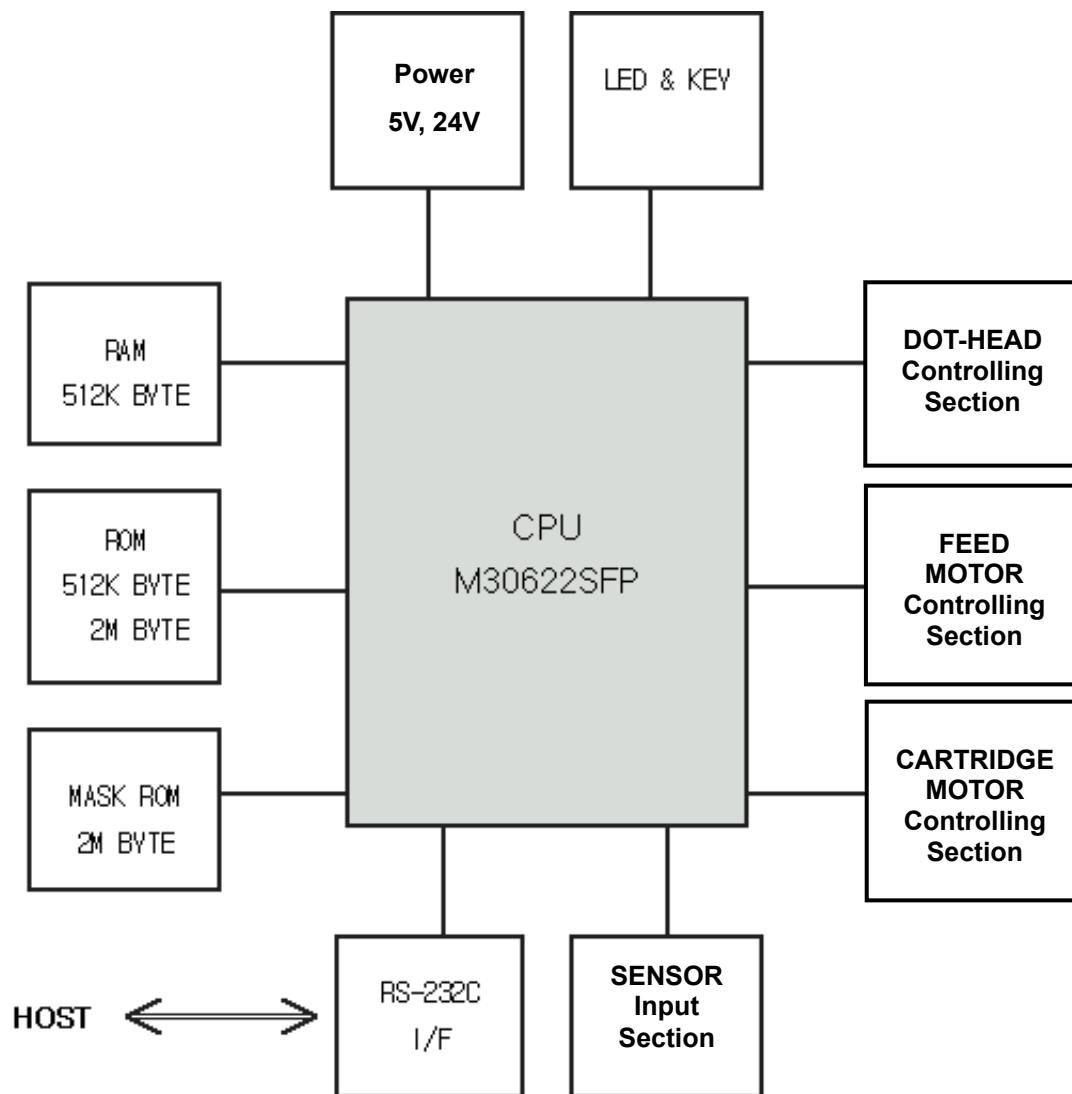
Ribbon Cassette is posited on the DOT Header and fastened by side guider hole.

To take out Ribbon, grip side guider carefully and pick it up.

Ribbon Installation: grip both side of ribbon cartridge and put the Ribbon into Side Guider hole.

You need to turn the lever on Ribbon clock wise to make Ink Ribbon tighten.

**Circuit Diagram**



### 9.1.4 Unit Specifications

#### Basic Specifications

ITEM	Specifications	Remarks
Print Type	Serial Impact Dot Matrix	
Print Speed	Approx 2LPS (43Colum , 16cpi)	Excluded data transfer and processing time
Dot Pitch	0.353mm(Horizontal), .3175mm(Vertical)	
Paper Feeding	Friction Type	
Paper Type	Roll and Normal	
Paper Thickness	0.2mm (Maximum in Roll Type)	
Paper Width	76.2mm ± 0.7mm, 57.5 ± 0.5mm	
Header MTBF	3 hundred million times	
Print Error Rate	2/1,000	
Jam Error Rate	1/1,000	
Font Enlarger	X2	
Characters	Alpha numeric, Graphics, International	
Interface	RS-232C	
Power Supply	+24VDC (4A)	
Weight	2.5Kg	
Dimension	138(W) X 238(D) X 231(H)	
Environments	Working: 0~50°C, 10~90%	
	Storage: -25~70°C, 0~90%	

**Main Parts Specifications*****DOT HEAD***

ITEM	Specifications	Remarks
Vender	EPSON M-U110	
Type	Ballistic Type	Free Flight
Number of Wire	9 Wires	
GAP (Platen, Head)	0.45~0.55mm	
Current	1.3A (PEAK)	
DOT HEAD	Pulse Width	346usec ± 5usec MAX
	Frequency	
	Response	1,500Hz Max.
	Weight	28g
	Dimension	26(W) x 23.5(H) x 38.5(L)mm
	Life	300million DOTs

***Carriage Driver Motor***

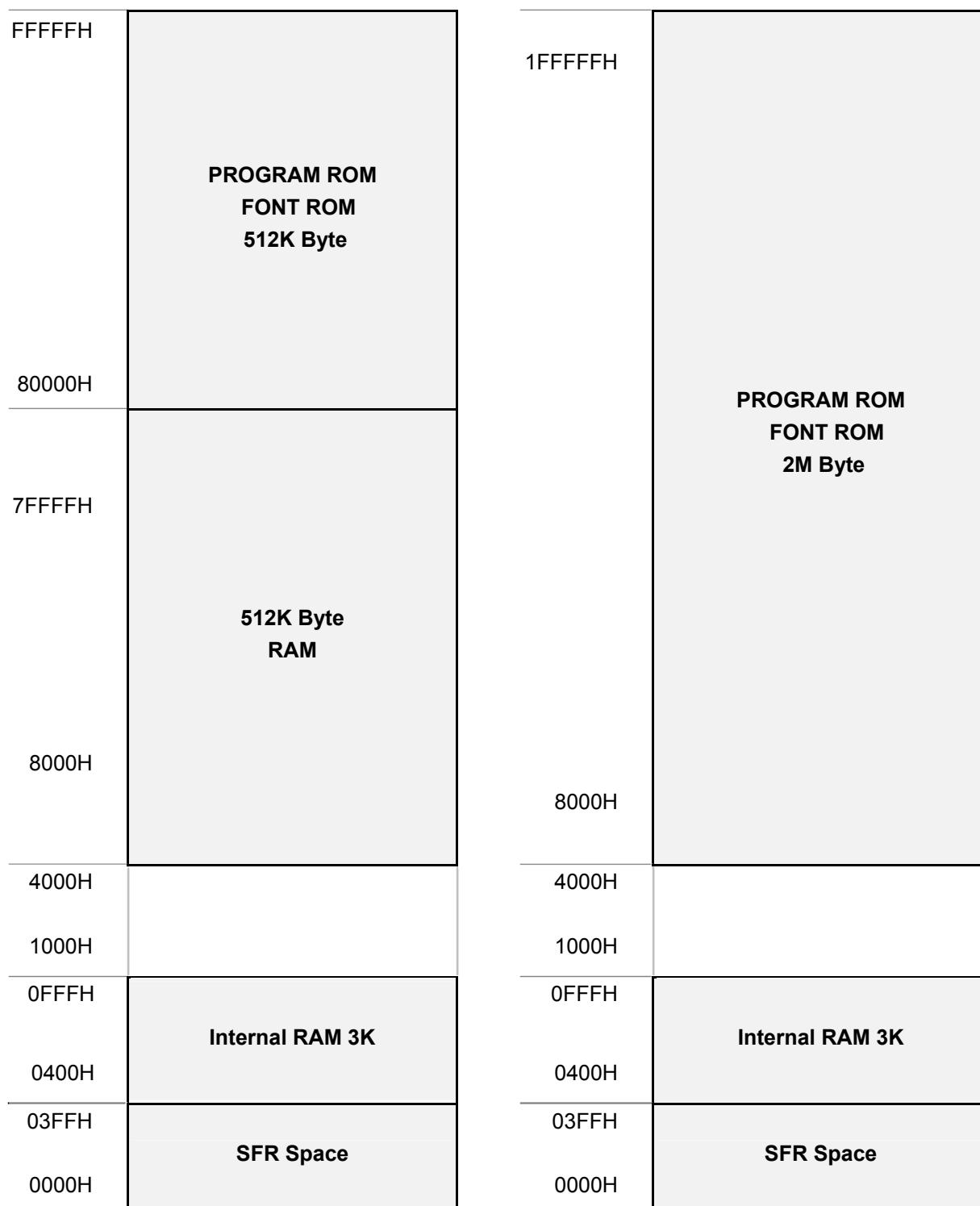
ITEM	Specifications	Remarks
Carriage Driver Motor	Type	4-phase PM stepping motor
	Coil Register	20Ω
	DRIVING CURRENT	350 ± 25mA
	HOLD CURRENT	106 ± 20mA
	DRIVE FREQUENCY	1200PPS(0.833ms)
	POWER	24V(Drive), 5V(when holding)

***Paper Feed Motor***

ITEM	Specifications	Remarks
Carriage Driver Motor	Type	4-phase PM stepping motor
	Coil Register	20Ω
	DRIVING CURRENT	300 ± 21mA
	HOLD CURRENT	90 ± 20mA
	DRIVE FREQUENCY	400PPS(2.5ms)
	Minimum Feed Pitch	0.176 ± 0.1mm(1/144") per step 4.233 ± 0.15mm(1/6") per 24step
	Paper Feed Time	54.6ms/4.233mm
	POWER	24V(Drive), 5V(when holding)

**Ribbon Cassette**

ITEM	Specifications	Remarks
Ribbon Cassette	Type	EPSON ERC-39
	Color	Purple
	LIFE	3 Millions Characters, 7 x 9 font
	Martial	Oil Ink
	Thickness	0.119 ± 0.0005MM
	TENSILE STRENGTH	5kg, 1/2inch
	RIBBON WINDING	Over 200G
	RIBBON SLIP TQ	13mm(W) x 42M(L)
	Noise	30 ± 5 dB

**MoniMax 5600****9. Journal Printer*****Memory Map***

**ROM & RAM Addressing**

CPU						Code ROM (4Mbit)	Font ROM (16Mbit)							
	A19	A18	A17	A16	Address	Address	BK0	BK1	BK2	BK3	BK4	BK5	BK6	BK7
SEG15	1	1	1	1	F0000h	70000h								
SEG14	1	1	1	0	E0000h	60000h								
SEG13	1	1	0	1	D0000h	BK8	50000h	SA5	SA9	SA13	SA17	SA21	SA25	SA29
SEG12	1	1	0	0	C0000h		40000h	SA4	SA8	SA12	SA16	SA20	SA24	SA28
SEG11	1	0	1	1	B0000h		30000h	SA3	SA7	SA11	SA15	SA19	SA23	SA27
SEG10	1	0	1	0	A0000h		20000h	SA2	SA6	SA10	SA14	SA18	SA22	SA26
SEG9	1	0	0	1	90000h		10000h	SA1	SA5	SA9	SA13	SA17	SA21	SA25
SEG8	1	0	0	0	80000h		00000h	SA0	SA4	SA8	SA12	SA16	SA20	SA24
						SRAM (4Mbit)								
SEG7	0	-	-	-	70000h	70000h	-	-	-	-	-	-	-	-
SEG6	0	-	-	-	60000h	60000h	-	-	-	-	-	-	-	-
SEG5	0	-	-	-	50000h	50000h	-	-	-	-	-	-	-	-
SEG4	0	-	-	-	40000h	40000h	-	-	-	-	-	-	-	-
SEG3	0	-	-	-	30000h	30000h	-	-	-	-	-	-	-	-
SEG2	0	-	-	-	20000h	20000h	-	-	-	-	-	-	-	-
SEG1	0	-	-	-	10000h	10000h	-	-	-	-	-	-	-	-
SEG0	0	-	-	-	00000h	00000h	-	-	-	-	-	-	-	-

**Control Port Define**

PORT	PIN NO	Name	Logic	Function
P0	P0.0-P0.7	D0 - D7	I/O	DATA BUS
P1	P1.0-P1.7	HDOTO - HDOT7	O	DOT HEAD DATA BUS
P2	P2.0-P2.7	A0 - A7	O	ADDRESS BUS

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PORT	PIN NO	Name	Logic	Function
P3	P3.0-P3.7	A8 - A15	O	ADDRESS BUS
P4	P4.0-P4.3	A16 - A19	O	ADDRESS BUS
	P4.4	BANK_S0	O	MEMORY Expansion BANK 0
	P4.5	BANK_S1	O	MEMORY Expansion BANK 1
	P4.6	CS2	O	MEMORY Expansion CHIP SELECT
	P4.7	BANK_S2	O	MEMORY Expansion BANK 2
P5	P5.0	RD	L/O	MEMORY READ, LOW ENABLE
	P5.1	NC		NO CONNECT
	P5.2	WR	L/O	SRAM WRITE, LOW ENABLE
	P5.3	NC		NO CONNECT
	P5.4	NC		NO CONNECT
	P5.5	/HOLD	H/I	FIXED
	P5.6	NC		NO CONNECT
	P5.7	/RDY	H/I	FIXED
P6	P6.0	CTS	L/I	CLEAR TO SEND, 'L' -> Transfer
	P6.1	RTS	L/O	REQUEST TO SEND 'L' -> Receive
	P6.2	RXD	I	DATA Received
	P6.3	TXD	O	DATA Transmit
	P6.4	ROM_RY	I	'H' -> STAND BY MODE
	P6.5	S1-1	I	DATA RECEPTION ERROR
	P6.6	S1-2	I	CR CHARACTER
	P6.7	S1-3	I	HANDSHAKING
P7	P7.0	DUMP_KEY	L/I	FEED Direction, Character PRINTING
	P7.1	FEED_KEY	L/I	LINE FEED, SETTING PRINTING
	P7.2	HEAD_PULSE	O	HEAD CLOCK
	P7.3	HEAD_PULSE_EN	L/O	HEAD Power ENABLE
	P7.4	ROLL_MOT	O	PAPER WINDING MOTOR

**MoniMax 5600****9. Journal Printer**

PORT	PIN NO	Name	Logic	Function
	P7.5	LED_ERROR	L/O	ERROR DISPLAY
	P7.6	LED_PAPER_OUT	H/O	PAPER OUT, PAPER NEAR END
	P7.7	NC	H/O	NO CONNECT
P8	P8.0	BLACK_MK	L/I	BLACK MARK SENSOR : NOT USED
	P8.1	NEAR_CK	L/I	NEAR END PAPER
	P8.2	CR_HOME	L/I	CARRIAGE HOME POSITION
	P8.3	/INT1	H/I	FIXED
	P8.4	/INT2	H/I	FIXED
	P8.5	/NMI	H/I	FIXED
	P8.6	PP_SET	L/I	PAPER Detect SENSOR
	P8.7	HEAD DOT8	O	DOT HEAD DATA8
P9	P9.0	CRM_A	O	CARRIAGE MOTOR PHASE A
	P9.1	CRM_B	O	CARRIAGE MOTOR PHASE B
	P9.2	CRM_CA	O	CARRIAGE MOTOR PHASE /A
	P9.3	CRM_CB	O	CARRIAGE MOTOR PHASE /B
	P9.4	LFM_A	O	LINE FEED MOTOR PHASE A
	P9.5	LFM_B	O	LINE FEED MOTOR PHASE B
	P9.6	LFM_CA	O	LINE FEED MOTOR PHASE /A
	P9.7	LFM_CB	O	LINE FEED MOTOR PHASE /B
P10	P100	DH_TH	I	Head Temperature Detector
	P101	S1-4	I	WORD LENGTH SELECTION(7, 8BIT)
	P102	S1-5	I	PARITY CHECK
	P103	S1-6	I	PARITY SELECTION
	P104	S1-7	I	BAUD RATE SELECTION (4800, 9600, 19200, 38400BPS)
	P105	S1-8	I	CHARACTER PER LINE
	P106	S1-9	I	CHARACTER DEVIDED AND PRINT
	P107	S1-10	I	CHARACTER DEVIDED AND PRINT

**Connectors on Main Board****• DOT HEAD I/F (CN1)**

PIN NO	Signal	Direction	Function
1	HM_HOME_OUT	OUT	CARRIAGE HOME POSITION
2	VCC	IN	+5V
3	HM_PP_SET	IN	PAPER Detection SENSOR
4	HM_BLACK_MK	IN	BLACK MARK SENSOR(OPTIONAL)
5	GND	OUT	GROUND
6	HD1	IN	HEAD DATA 1
7	HD3	IN	HEAD DATA 3
8	HD5	IN	HEAD DATA 5
9	HD7	IN	HEAD DATA 7
10	HD8	IN	HEAD DATA 8
11	VCC	IN	+5V
12	DH_TH	OUT	HEAD Temperature Thermister
13	HD4	IN	HEAD DATA 4
14	HD6	IN	HEAD DATA 6
15	HD0	IN	HEAD DATA 0
16	HD2	IN	HEAD DATA 2
17	VCC24	IN	+24V
18	VCC24	IN	+24V
19	VCC24	IN	+24V
20	CR_MT_BB	IN	CARRIAGE MOTOR SIGNAL
21	CR_MT_AB	IN	CARRIAGE MOTOR SIGNAL
22	CR_MT_BA	IN	CARRIAGE MOTOR SIGNAL
23	CR_MT_AA	IN	CARRIAGE MOTOR SIGNAL
24	LF_MT_BB	IN	LINE FEED MOTOR SIGNAL
25	LF_MT_AB	IN	LINE FEED MOTOR SIGNAL
26	LF_MT_BA	IN	LINE FEED MOTOR SIGNAL

**MoniMax 5600****9. Journal Printer**

PIN NO	Signal	Direction	Function
27	LF_MT_AA	IN	LINE FEED MOTOR SIGNAL

**• ROLL Motor I/F (CN2)**

PIN NO	Signal	Direction	Function
1	VCC24	IN	+24V
2	NC	-	NO CONNECT
3	ROLL_MOT	IN	PAPER WINDING MOTOR SIGNAL

**• Paper Detection Sensor (CN3)**

PIN NO	Signal	Direction	Function
1	PP_SET_CK	OUT	PAPER Detection SENSOR
2	VCC	IN	+5V
3	GND	IN	GROUND

**• Page Mark Sensor (CN4)**

PIN NO	Signal	Direction	Function
1	VCC	IN	+5V
2	GND	IN	GROUND
3	VCC	IN	+5V
4	PM_CK	OUT	PAGE MARK SENSOR (NOT USED)

**• Near End Paper Sensor (CN5)**

PIN NO	Signal	Direction	Function
1	VCC	IN	+5V
2	GND	IN	GROUND
3	VCC	IN	+5V
4	NEAR_END_CK	OUT	PAPER Detection SENSOR

**MoniMax 5600****9. Journal Printer****• Near End Paper Mechanical Switch I/F (CN6)**

PIN NO	Signal	Direction	Function
1	NEAR_END_CK	OUT	PAPER Near End SENSOR
2	GND	IN	GROUND

**• Key Board I/F (CN7)**

PIN NO	Signal	Direction	Function
1	VCC	IN	+5V
2	BACK FEED KEY	OUT	Backward FEED, Character PRINTING
3	FEED KEY	OUT	Forward FEED, SETTING PRINTING
4	LED ERROR	IN	ERROR DISPLAY
5	LED_PAPER OUT	IN	PAPER OUT, PAPER NEAR END
6	GND	IN	GROUND

**• Serial I/F (CN8)**

PIN NO	Signal	Direction	Function
1	GND	Ground	Signal Ground
2	CTS	IN	Data Status LAMP, 'L' -> Ready to send
3	RTS	OUT	Ready to Receive, 'L'
4	GND	Ground	Signal Ground
5	RXD	IN	Data Receive
6	TXD	OUT	Data Transmit
7	GND	Ground	Signal Ground

**• Serial I/F (CN9)**

PIN NO	Signal	Direction	Function
1	VCC24	IN	+24V
2	VCC24		+24V
3	GND		GROUND
4	GND		GROUND

## 9.2 T-JPR

This printer receives the command from the host, or main control unit, and prints the information that the customers want.

### 9.2.1 Specifications

#### Printing Specifications

Item	Specifications
Printing Method	Thermal printing
Font Configuration	Alpha numeric(95), graphics(128), international character(32) Font Download
Print Speed	Max: 200mm/sec, Typ: 170mm/sec
Resolutions	200dpi(8dots/mm)
Print Width	80mm
Print Head Life	100km
Power	24VDC ± 5%, 6A
Dimensions	167(W) x 350(D) x 230(H)
Weight	About 3 kg (without paper roll)

#### Roll Paper Specifications

Item	Specifications
Paper Type	Thermal Paper
Paper Width	80mm
Roll Diameter	Max. 150mm
Thickness	Single : 0.05mm to 0.10mm
Print Area	80mm
Roll Core	Use Only Roll Paper That is not Glued to the Core

**MoniMax 5600****9. Journal Printer****Interface Specifications**

Item	Specifications
Data transmission	RS-232C (serial) USB
Synchronization	Asynchronous
Handshaking	XON / XOFF control
Signal levels	Mark = -3 to -15V ... logic '1'/OFF SPACE = +3 to +15V ...logic '0'/ON
Baud rate	4800, 9600, 19200, 38400 BPS
Data word length	8 bit
Parity	None parity
Stop bits	1 bit
Connector	SMAW200-07P 5268-03 (MOLEX) USB TYPE B

**Journal Specifications**

Item	Specifications
Journal Width	84mm
Journal Diameter	ø160mm
Journal Core	ø40mm

**Reliability Specification**

Item	Specifications
Operating environment	5°C ~ 45°C (temperature) 10 ~ 80%RH, at 40°C, no condensation (relative humidity)
Storage environment	-20°C ~ +60°C (temperature) 5 ~ 95%RH, at 40°C, no condensation (relative humidity)

### 9.2.2 Configuration and operation of the journal printer

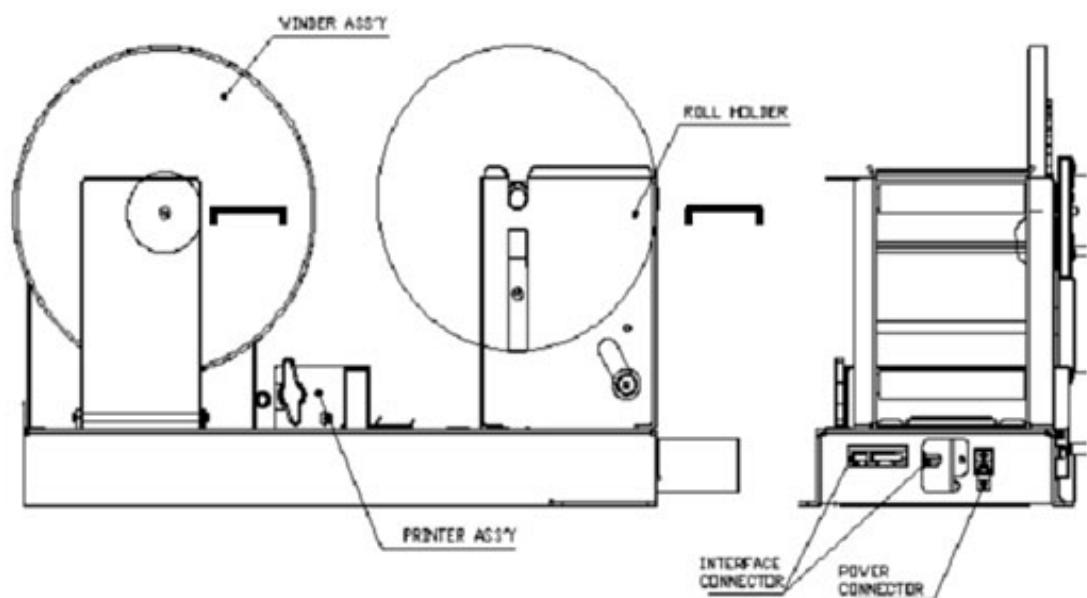
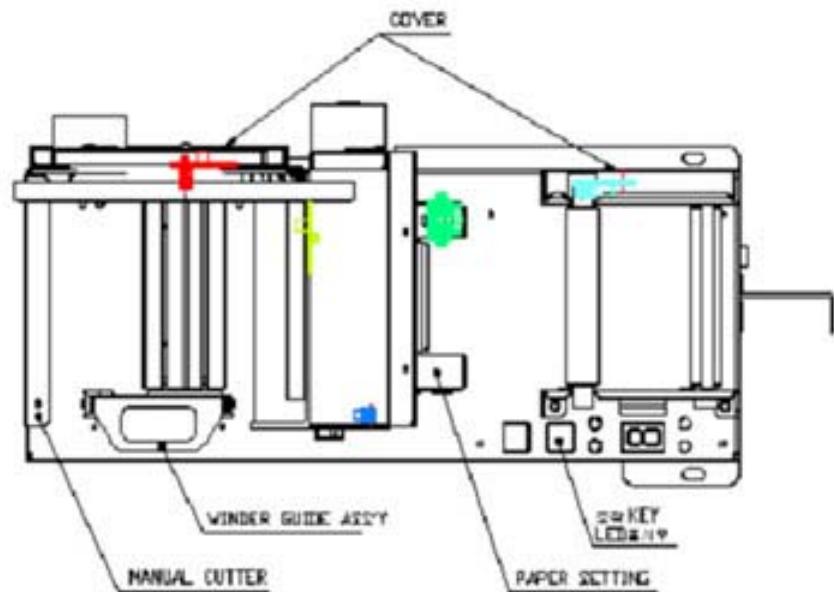
#### Configuration

<p><b>Printing Section</b></p> <ul style="list-style-type: none"><li>- Thermal Printer Module</li><li>- Auto Feeding</li><li>- Cutter Manual</li></ul>	<p><b>Frame Section</b></p> <ul style="list-style-type: none"><li>- Base Ass'y</li><li>- Winder Bracket Assembly</li></ul>
<p><b>Operation Section</b></p> <ul style="list-style-type: none"><li>- Feed Key</li><li>- Back Feed Key</li><li>- LED Display Section</li><li>- 7 Segment Display</li><li>- Dip Switch</li></ul>	<p><b>Rewinder &amp; Roll Box Section</b></p> <ul style="list-style-type: none"><li>- Winder Assembly</li><li>- Roll Paper Collection Section</li><li>- Paper Residual Sensor Assembly</li></ul>
<p><b>Electric Outfitting Section</b></p> <ul style="list-style-type: none"><li>- Main Board Assembly</li></ul>	<p><b>Cover Section</b></p> <ul style="list-style-type: none"><li>- Winder Cover</li><li>- Roll Box Cover</li></ul>

MoniMax 5600

9. Journal Printer

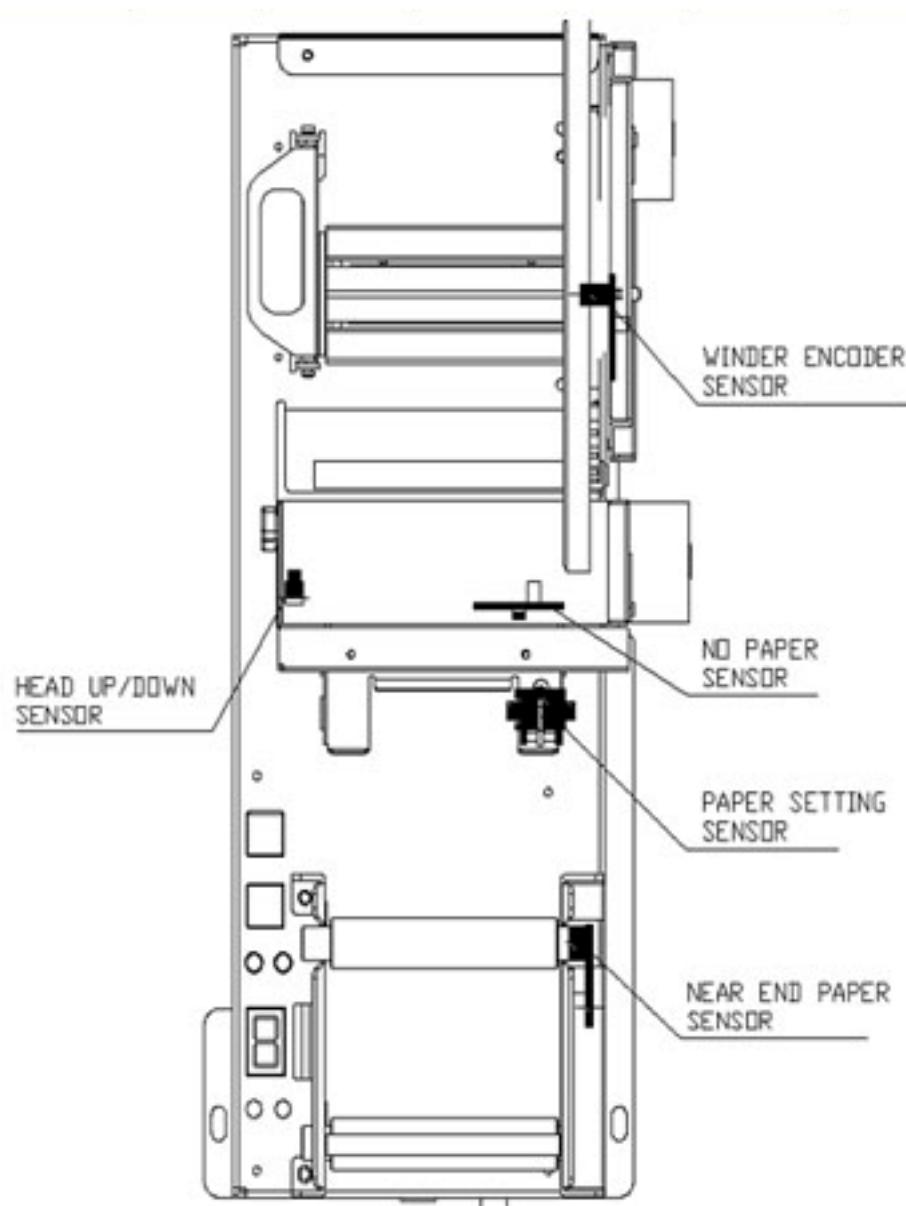
Outside view of the journal printer

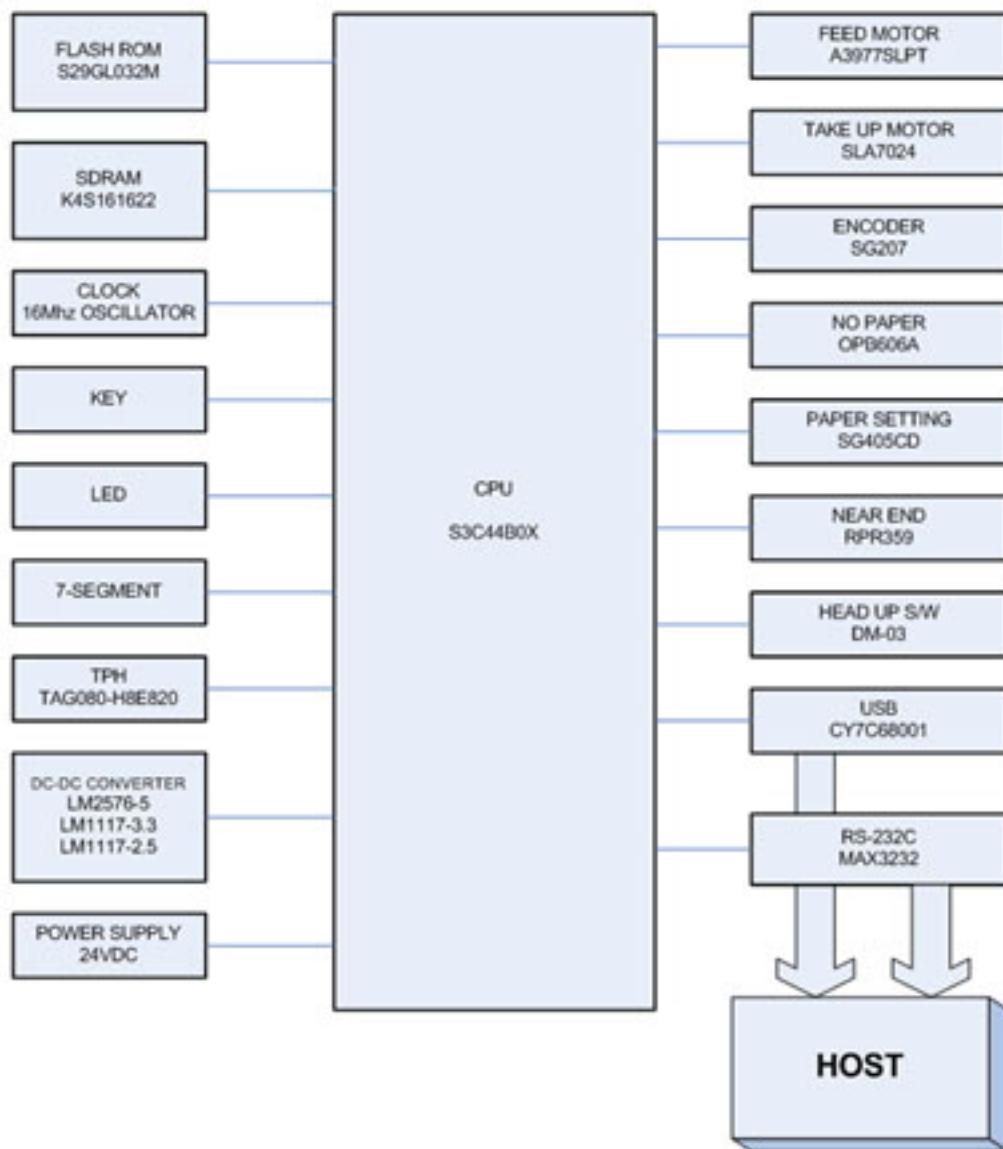


**MoniMax 5600**

**9. Journal Printer**

**Sensor Layout**



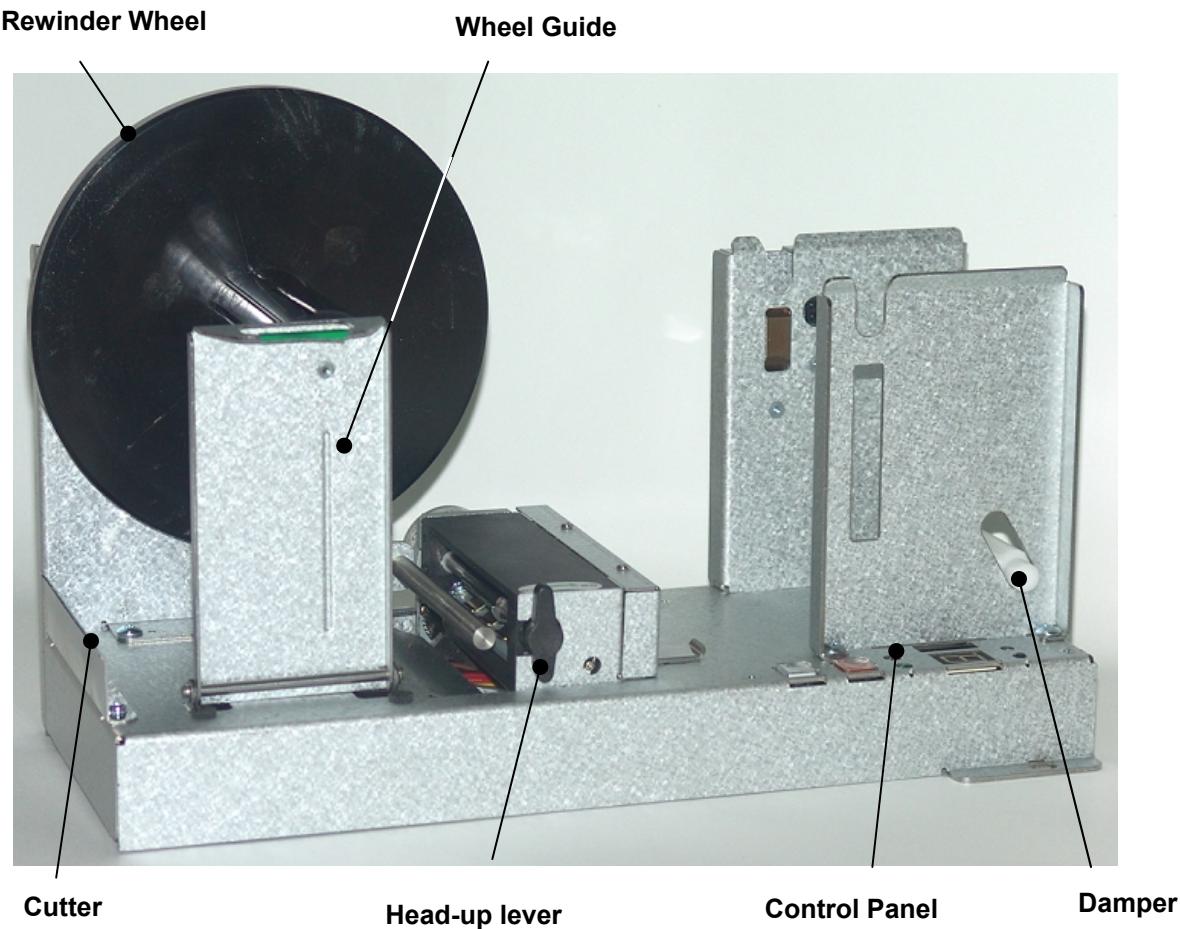
**MoniMax 5600****9. Journal Printer****System Block Diagram**

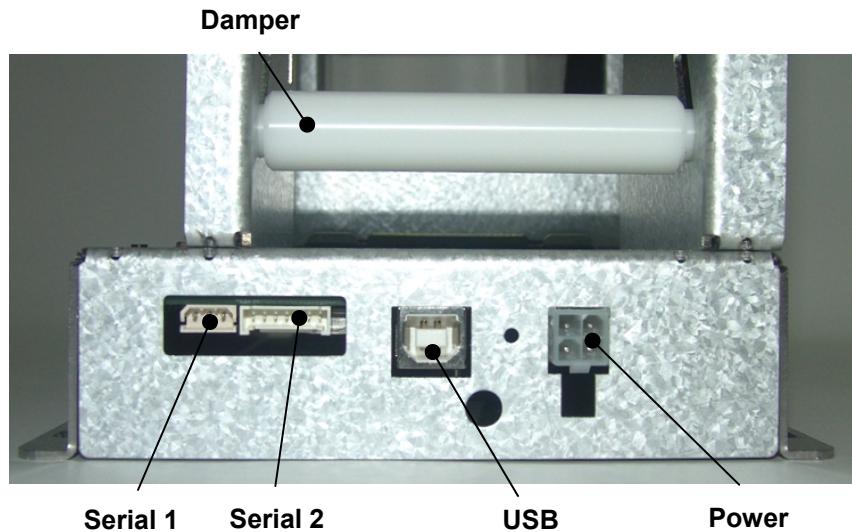
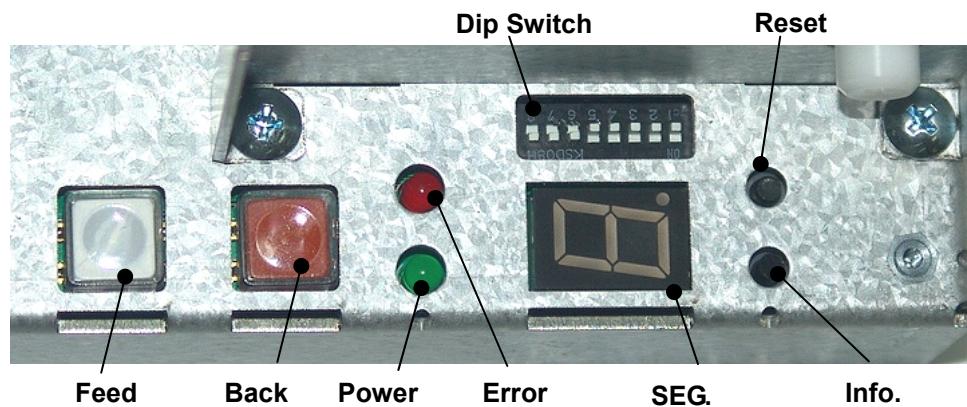
**MoniMax 5600**

**9. Journal Printer**

**Component name and location**

1) Front section



**MoniMax 5600****9. Journal Printer****2) Rear section****3) Control Panel**

- Feed Button : Feed the paper at a certain length and wind it on the rewinder section.
- Back Button : Turn the rewinder wheel conversely and unwind the wrapped paper.
- Info. Button : Print out the version and status information of the printer.
- Reset Button : Reset the printer
- Power LED
  - ① Blink : When the power is supplied.
  - ② Off : When the power is off.
- Error LED
  - ① ON : When the error is occurred on the printer.
  - ② OFF : When the printer is normal.
- SEG. : Display the status of the printer.

### Description of each part

#### 1) Memory

- Memory consists of 32Mbit FLASH ROM and 16Mbit SRAM.
- FLASH ROM is the section of  $00000000_{16}$ ~ $01BFFFFF_{16}$ .
- SDRAM is the section of  $0C000000_{16}$ ~ $0DFFFFFF_{16}$ .

#### 2) DIP SWITCH

- Input as CPU GPC0~7.

#### 3) Sensor

- Remove the first noise component by RC low-pass filter configuration.
- Check the signal of all sensors by A/D converter of CPU.
- No paper sensor detects the paper and loads it automatically.
- Paper Setting sensor detects the existence or nonexistence of the paper.
- Winder Encoder sensor detects the drive status of Take up unit.
- Near end sensor detects the residual of the roll paper.

#### 4) RS-232C COMMUNICATION

- Serial communication with the host by RS-232C.
- Use the signals of TXD, RXD, CTS and RTS by CN1 connector.
- Use the signals of TXD and RXD by CN17 connector.

#### 5) USB COMMUNICATION

- Serial communication with the host by USB 2.0 Port.

#### 6) LED

- Control Error LED and Power LED by Transistor.

#### 7) SEGMENT

- Control the segment in the section of CPU  $0200000016$ ~ $0400000016$  by 74HCT273.

#### 8) Paper Feed Motor

- Paper feed motor is the bipolar stepping motor and control by PWM current control driver.

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**9) Take Up Motor**

- Take up motor is the unipolar stepping motor and control by PWM current control driver.

**10) TPH**

- Use CMOS TTL(74HCT244) and transfer the data reliably.
- Confirm the stable drive of TPH by controlling 24V power.

**11) POWER**

- Convert 24VDC into 5VDC and supply it to 5V logic circuit.
- Convert 5VDC into 3.3VDC and supply it to 3.3V logic circuit.
- Convert 5VDC into 2.5VDC and supply the output power of CPU and AD sensor.

**12) Frame section**

- Consist of main base, winder bracket assembly, and so on.
- Each frame uses the cold rolled steel ( $t=1.6\text{mm}$ ) and screwed up by M4 screw using Guide Indenting.

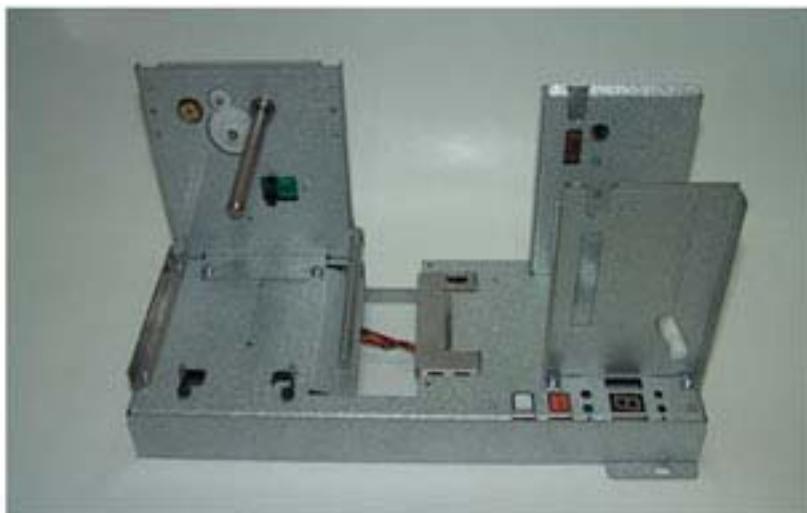


Fig. 9.1 Frame Section

**MoniMax 5600****9. Journal Printer****13) Cover**

- Cover consists of winder bracket cover, roll box cover, and so on to protect the harness.
- Each cover uses the thin cold rolled steel ( $t=1.0\text{ mm}, 1.0\text{ mm}, 1.2\text{ mm}$ ), guide indenting and M3 screw.



Fig. 9.2 Cover

**14) Operation section**

- Consists of feed, back feed key, LED display part and DIP switch.
- Display the paper transfer, power ON/OFF, error, and so on.
- Feed and back feed key use the mechanical switch and the signal is inputted when users press the switch. This unit is located inside of the main base frame and is mounted at the bottom of the main board.
- LED Display Section
  - Power : Display the power (DC,+24V) ON/OFF status
  - Existence or nonexistence of the paper : Display the existence or nonexistence of the printer paper setting.
  - Paper shortage : When the residual of the paper is 10%. (modifiable)
  - Rewinder error : When the rewinder section doesn't drive.
- DIP Switch Section

DIP SWITCH SETTING			
No	Function	On	Off
1	Emulation mode	T1	T-JPR
2	Data reception error	Prints "?"	Ignored
3	CR + LF character	CR + LF	CR only
4	Historical Control	ON	OFF
No	Printing Density	5	6
5	Level 1	OFF	OFF
6	Level 2	OFF	On
	Level 3	On	OFF
	Level 4	On	On
No	Baud rate	7	8
7	4800 bps	OFF	OFF
8	9600 bps	OFF	On
	19200 bps	On	OFF
	38400 bps	On	On

**MoniMax 5600**

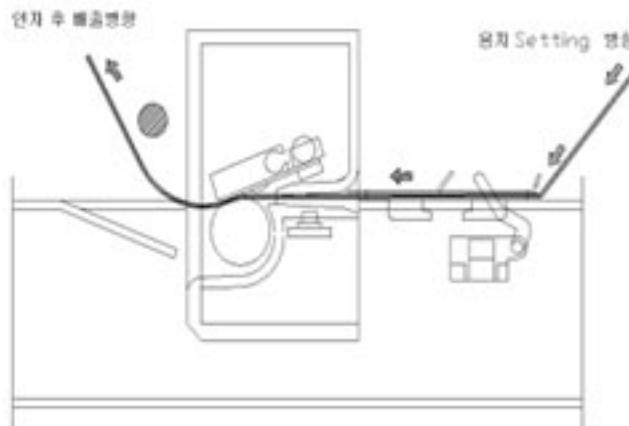
**9. Journal Printer**



Fig.9.3 Operation section

**15) Printing Section**

- Printing section consists of paper setting guide and thermal printer module.
- Print out by Max 200mm/sec.
- Set the paper automatically and transfer it to the printing location. Then the thermal head applies heat to the thermal paper. The printed paper is dispensed as shown in below picture.



9.4 Printing section

## MoniMax 5600

## 9. Journal Printer

### 16) Rewinder Section

- Rewinder section consists of rewinder and detection sensor.
- Rewind the printed paper by 50mm/sec.

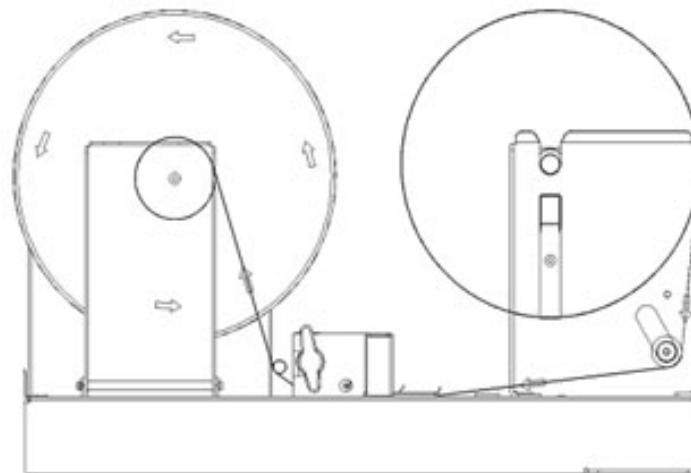


Fig.9. 5 Rewinder section

### 17) Roll Box Section

- Roll box section consists of the roll paper collection box and residual detection sensor assembly.
- The residual detection sensor is variable by the user.

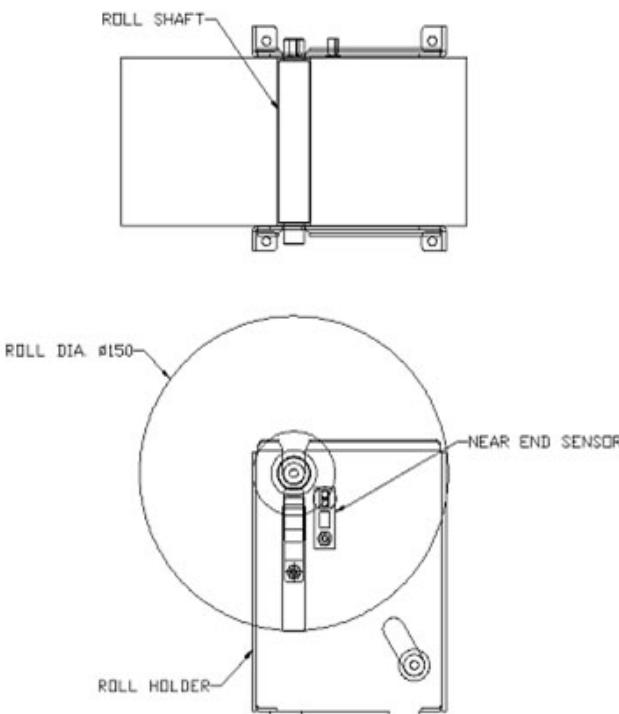


Fig.9.6 Roll box section

**MoniMax 5600**

**9. Journal Printer**

**18) Electric Outfitting Section**

- Electric outfitting section consists of main board and operation section mounted on the main board.
- Transfer the signal needed to drive the journal printer.



Fig. 9.7 Main Board

### 9.2.3 Journal printer installation

1) Connect the power and communication cable

- Turn off the power supply and connect the power and communication cable.

2) Dip Switch Setting

- Dip switch setting values are applied only for the first power supply, so it should be changed after turning off the power.

No.	Function	On	Off
1	Emulation mode	T1	T-JPR
2	Data reception error	Prints "?"	Ignored
3	CR + LF character	CR + LF	CR only
4	Historical Control	ON	OFF
No.	Printing Density	5	6
5, 6	Step 1	Off	Off
	Step 2	Off	On
	Step 3	On	Off
	Step 4	On	On
No.	Baud rate	7	8
7, 8	4800 bps	Off	Off
	9600 bps	Off	On
	19200 bps	On	Off
	38400 bps	On	On

### 9.2.4 Error and troubleshooting

#### Troubleshooting by the status of the error display section

Indication	Name	Description	Troubleshooting
0	Normal Status	Normal Status	
1	No paper	The paper doesn't inserted into the printer. Or the paper runs out.	Mount the new paper.
2		Sensor error, which detects the existence or nonexistence of the paper.	Take measures by inspection method of the sensor.
3	Printer Head open	Printer head open lever is opened.	Close the head open lever in the direction of the CLOSE.
		Printer Head Open Switch Error	Take measures by inspection method of the sensor.
5	Printer Head Overheat	Printer Head is overheated by the long time printing.	Wait the temperature of the SET goes down sufficiently.
6	Near-end sensor error	When the residual of the paper is less than Ø30mm.	Mount the new paper.
		Near-end Sensor Error	Take measures by inspection method of the sensor.
7	Rewinder Operation Error	Rewinder operates more than 7 but sensor values aren't changed.	Check whether the rewinder doesn't turn smoothly because of the excessive force.
		Rewinder turns more than 10 but sensor values are changed continuously..	Take measures by inspection method of the sensor.
8	CR code error	There is a data to be printed but the received command is the print completion, not print command (CR).	

**MoniMax 5600****9. Journal Printer****How to check the error**

NO	Check Item	Description	Standard	How to check	Remarks
1	Status of the printer	Description of the printing	Dot should not be missed.	Check the status of the printing with the naked eyes.	If the module is bad, replace it.
		Density of the printing	Printing density should be sufficient.		
2	Sensor	Auto Setting	Check the LED lighting during the operation.	Check the printer operates normally. Or cause the error and check the status.	If the sensor is bad, replace it. (Refer to the standard of the assembly and adjustment.)
		Rewinder Error			
		Residual of the paper			
3	Paper Transfer	Clean the paper guide	Roll paper should pass through the guide section.	Check the roll paper is well dispensed through guide.	Remove the powder and dust with the brush.
4	Opeation PANEL	Lighting of the power LED	Light the LED during turning on the power.	Check LED lighting or blackout of the power ON/OFF.	
5	Rewinder	Paper-extracting	Drive the printer without paper-extracting.	Check the paper-extracting during drive.	
6	Exterior	Cleaning	A piece of paper or the dust should not be inside of the printer.	Check whether there is any dust or powder on the exterior or gap.	Wipe with the dry cloth or alcohol.
		Lubrication	Oil should not be dried.	Check the rewinder or drive section operates well.	
		Abnormal sound	Abnormal sound, smell or temperature rise should not be there.	Check whether the error occurs during operation.	
		Abnormal smell			
		Abnormal temperature rise			
7	Control Circuit	Clean and inspection of the printer	There should be no dust in the print substrate and should be no error in the pattern parts.	Clean with the air compressor and check whether there is any error in the pattern parts.	
		Wiring, cleaning of the connector and inspection	Wiring damage, looseness of connector and the bad connection should not be there.	Check the wiring section with the naked eyes.	

**MoniMax 5600****9. Journal Printer**

NO	Check Item	Description	Standard	How to check	Remarks
8	Power	Measure the power	There should be the standard of the voltage for each section.	Measure each terminal with the multi-meter.	
9	General Operation	Operation Status	Seamless printing or rewind by the roll paper supply.	Check the paper is set and rewound smoothly.	

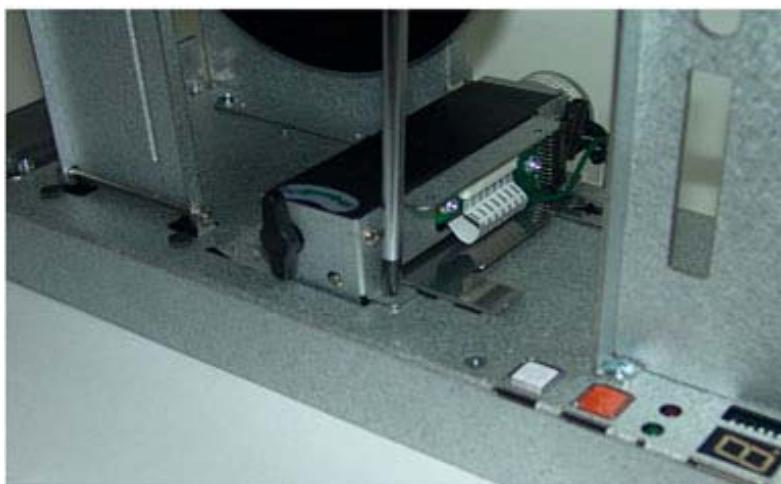
### 9.2.5 Assembly adjustment standard

#### Thermal Printer Module Disassembly

- 1) Remove the cover of the printer connector.



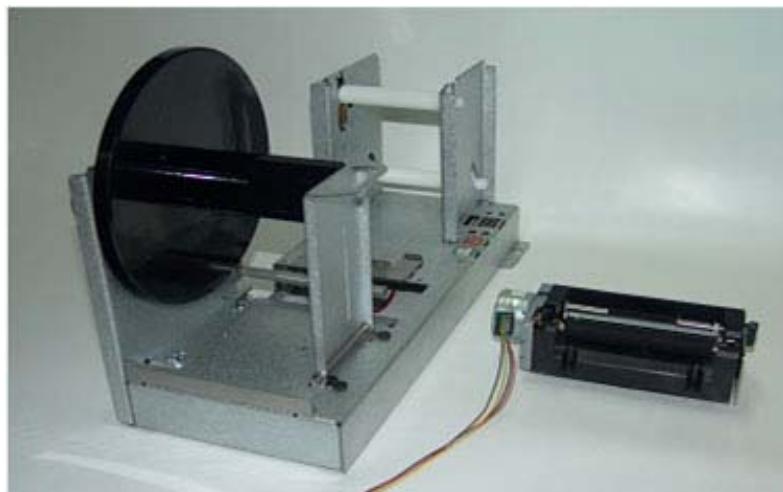
- 2) Disconnect each cable and remove 2 M3 screws for fixing thermal printer.



**MoniMax 5600**

**9. Journal Printer**

- 3) Disassemble the thermal printer from the main frame.



**Sensor Disassembly**

(Sensor detecting existence or nonexistence of the rewinder, residual of the paper and existence or nonexistence of the paper)

- 1) Remove rewinder cover and M3 screw. Then disassemble sensor.



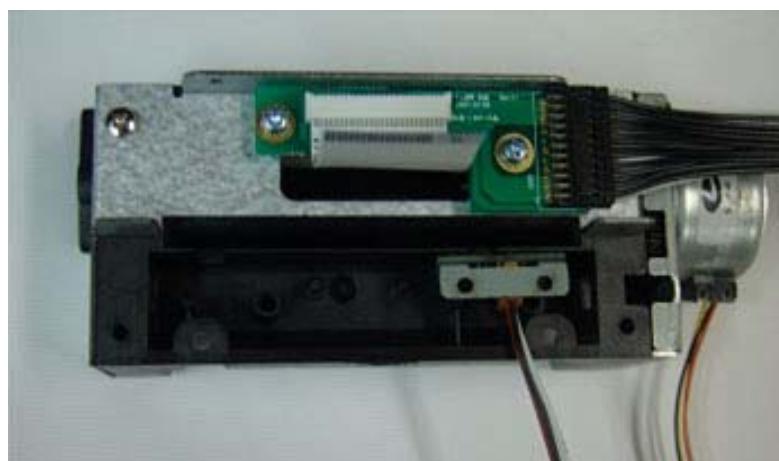
**MoniMax 5600**

**9. Journal Printer**

- 2) Remove roll box cover and M3 screw. Then disassemble the sensor detecting the residual of the paper.



- 3) Disassemble sensor detecting the existence or nonexistence of the paper.
  - Disassemble the printer module and then disassemble sensor.

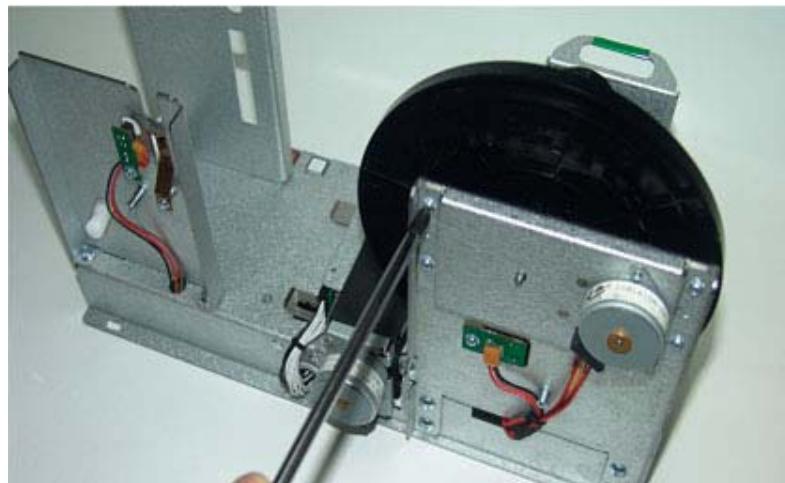


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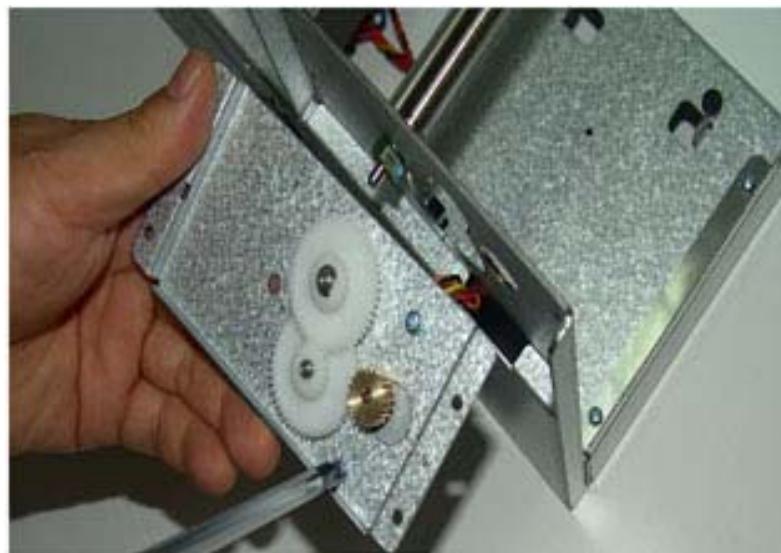
**9. Journal Printer**

**Disassemble drive section of the rewinder**

- 1) Remove M3x5 screw for fixing motor bracket on the drive section of the rewinder.



- 2) Remove M3x5 screw and disassemble motor.

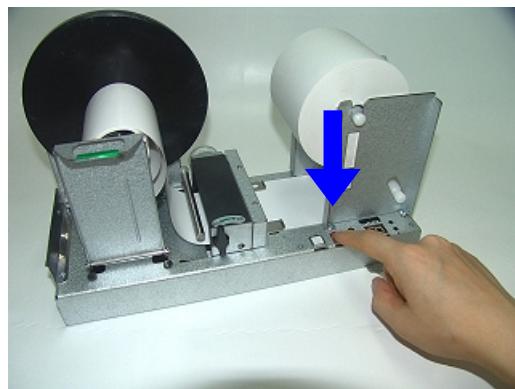


**Disassembly of the main board and key board**

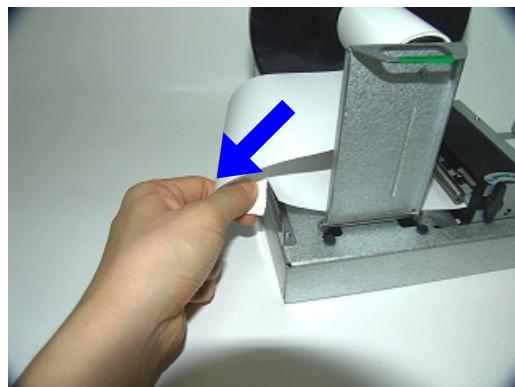


### 9.2.6 Remove the rolled paper from the rewinder.

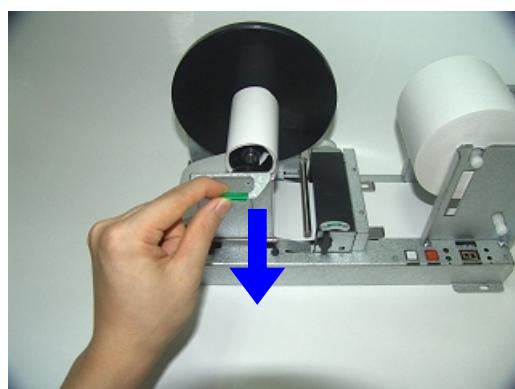
1) Press the BACK button and unroll the paper.



2) Cut the paper with the cutter. Be careful not to hurt the hand.



3) Open the rewinder wheel.



**MoniMax 5600**

**9. Journal Printer**

- 4) Removed the rolled paper.



## **Chapter 10. Power Supply**

## 10.1 Appearance

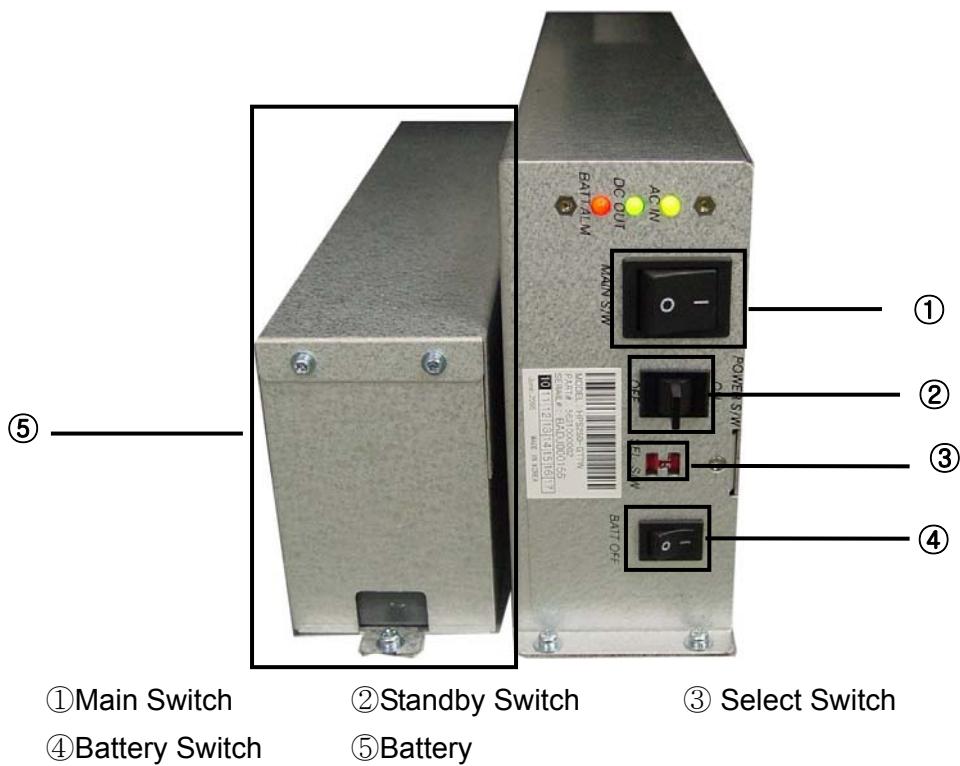


Fig. 10.1 Power Supply Appearance

### System Power On

- 1) Turn on Battery Switch.
- 2) Turn on Main Switch.

### System Power Off

- 1) Push down Power Switch for 1 second and then system will be shut down automatically.
- 2) Turn off Battery Switch after shutdown is finished..

### Warning

**Don't operate Main Switch on power supply when you would like to turn off the power.  
It may cause damage to operate system or destabilize control electronics in ATM**

## 10.2 Block diagram

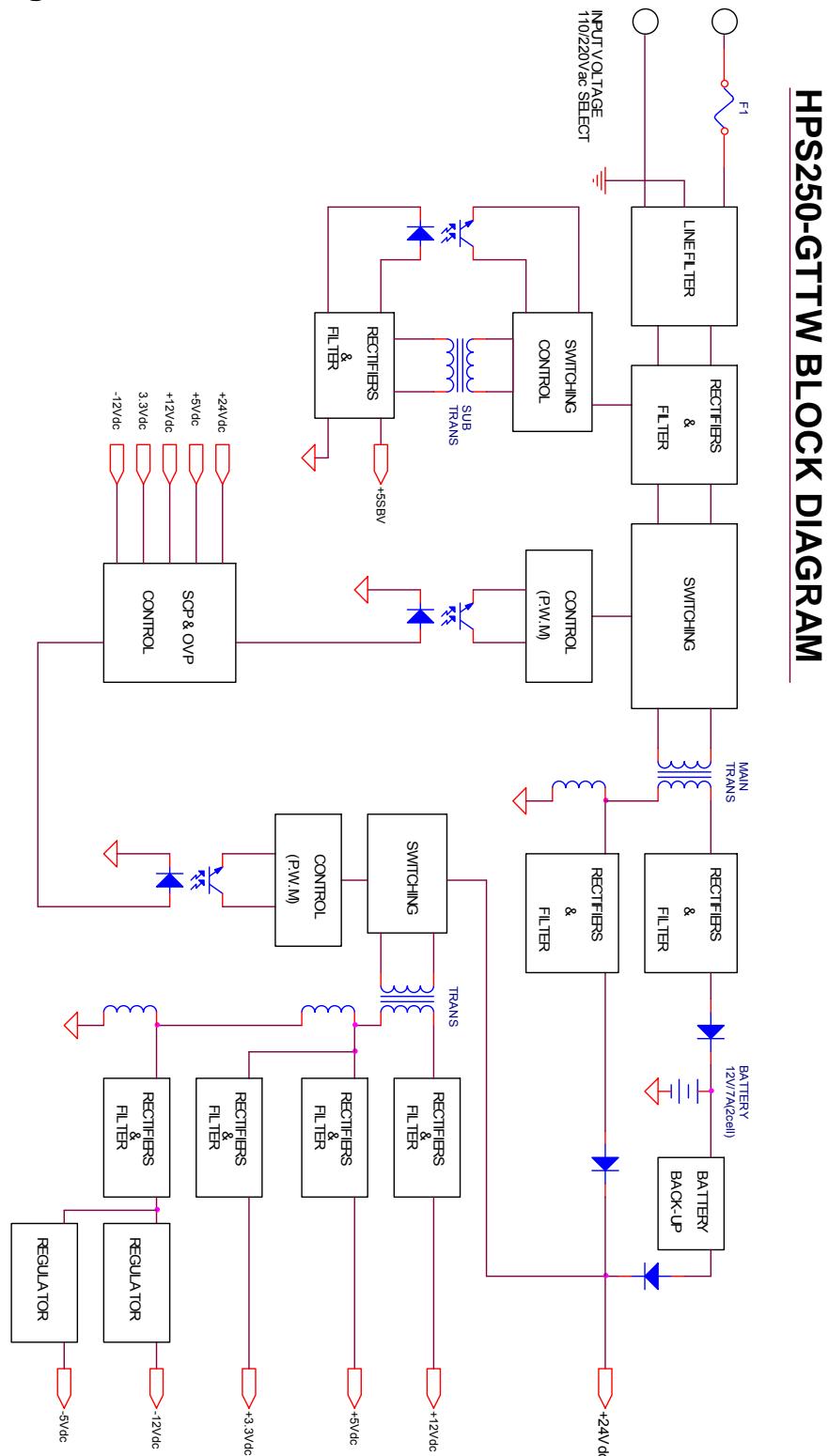


Fig. 10.2 Power Supply Block Diagram

## 10.3 Specifications

### 10.3.1. Environment Condition

CONDITION	OPERATING	STORAGE	CONDITION	OPERATING	MOVEMENT
TEMPERATURE	-5 ~ 45 °C	-40 ~ 70 °C	VIBRATION	0.5G	2.0G
HUMIDITY	30 ~ 90%	10 ~ 90%	IMPACT	5.0G	10.0G
M.T.B.F	30,000Hrs				

Table 10.1 Environment Condition

### 10.3.2. Mechanical Specification

DIMENSION(MAIN)	350(L) x 160(W) x 75(H)	CASE COLOR	-
CASE MATERIAL	GALVA 1.6t	CASE DRAWING NO.	-
WEIGHT	About 2.5Kg	MODEL LABEL	UL94-V0

Table 10.2 Mechanical Specification

### 10.3.3. Withstanding Voltage & Insulation Resistance

DIVISION	TEST POINT	TEST INPUT VOLTAGE	TEST CONDITION
WITHSTANDING VOLTAGE	* PRI – SEC	* 3.0 Kvac(1.5KVac)	DURING OF TEST: 1 min CUTOFF CURRENT: 10mA
	PRI - F.G	1.5 Kvac	
INSULATION RESISTANCE	PRI – SEC	500 Vdc	DURING OF TEST: 1 min INSULATION RES: ≥10Mohm
	PRI - F.G	500 Vdc	

NOTE 1) \* PRE – SEC WITHSTANDING VOLTAGE CONDITION : Y-CAP DELETE(3KVAC) / NO DELETE(1.5KVAC)

Table 10.3 Withstanding Voltage and Insulation Resistance

### 10.3.4. Input Specification

DIVISION	SPECIFICATION
INPUT CONNECTION	INLET FILTER(250VAC 6A)
INPUT VOLTAGE / CURRENT (SELECTION MODE)	100~127VAC ±10% / 5.5A 200~240VAC ±10% / 2.8A
FREQUENCY	47~63Hz(NORMAL:50/60Hz)
DISTORTION	10%
EFFICIENCY	70% MIN(at MAX LOAD)
HOLD-UP TIME	16.7ms MIN
INRUSH CURRENT	60A MAX
LEAKAGE CURRENT	3.5mA MAX

Table 10.4 Input Specification

**MoniMax 5600****10. Power Supply****10.3.5. Output Specification**

## 1) Main Output

DIVISION	SPECIFICATION						UNIT
CHANNEL	+3.3	+5.0	-5.0	+12.0	-12.0	+24.0	Vdc
VOLTAGE	3.14 ~ 3.47	4.75 ~ 5.25	-4.75 ~ -5.25	11.4 ~ 12.6	-11.4 ~ -12.6	22.8 ~ 25.2	Vdc
CURRENT	0 ~ 6.0	2.0 ~ 13.0	0 ~ 0.2	0.2 ~ 5.5 (Peak6.5A)	0 ~ 0.2	0 ~ 4.0 (Peak11A)	A
METHOD	SWITCHING	SWITCHING	SW & REG	SWITCHING	SW & REG	SWITCHING	MODE
RIPPLE	50	50	50	120	120	500	mVp-p
NOISE	0.3	0.3	0.3	0.4	0.4	1.0	Vp-p
SHOOT	±3	±3	±3	±4	±4	±5	%
O.V.P	3.76 ~ 4.3	5.74 ~ 7.0	-	13.4 ~ 15.6	-	26.5 ~ 34.0	Vdc
O.C.P	S.C.P	S.C.P	S.C.P	S.C.P	S.C.P	S.C.P	A

NOTE 1) +24V SHORT CIRCUIT PROTECTION: SHUT-DOWN or RELAY(P-OFF) ACTION

Table 10.5 Main Output

## 2) Sub Output

DIVISION	SPECIFICATION			UNIT
CHANNEL	+5VSBV(Stand-by)	BATTERY(Charge)	BATTERY(Discharge)	Vdc
VOLTAGE	4.75 ~ 5.25	26.5 ~ 27.6	24.0	Vdc
CURRENT	0 ~ 0.5	0.3	6.0	A
METHOD	SWITCHING	SWITCHING	BATTERY	MODE
RIPPLE	50	-	-	mVp-p
NOISE	0.3	-	-	Vp-p
SHOOT	±3	-	-	%
O.V.P	-	-	-	Vdc
O.C.P	S.C.P	0.7 ~ 0.9	FUSE	A

NOTE 1) Ripple &amp; Noise Test Condition : 20MHz, 10uF(ELEC)/0.1uF(CER)

2) S.C.P: Short Circuit Protection

3) For ensure U.P.S function, +24Vdc output of which power less than 150W, of battery must be continued for a minute when full charged(Charged for a day)

4) Stand-by D.C output go on while A.C input don't turned off, neglect P ON-N signal

5) Current of A.C input is 3.9A when 115Vac applied

Table 10.6 Sub Output

### 10.3.6. Requirements

- 1) Use the lamp of power supply as below
  - YELLOW LED: A.C INPUT(turn on if A.C input is normal)
  - GREEN LED: D.C OUTPUT(turn on if D.C output is normal)
  - RED LED: BATTERY ALARM(turn on if battery output is abnormal)
- 2) Apply extra outlet
  - 100~127Vac / 1.0A
  - 200~240Vac / 0.5A
- 3) Power Distribution

NO.	+3.3V/20W MAX	+5V/65W MAX	+12V/66W MAX	REMARK
1	20W less than	64W less than	36W less than	Total output shall not exceed 120W
2	20W less than	64W ~ 40W	36W ~ 60W	
3	14W less than	46W more than	60W more than	

Table 10.7 Power Distribution

### 10.3.7. Signal Output Specifications

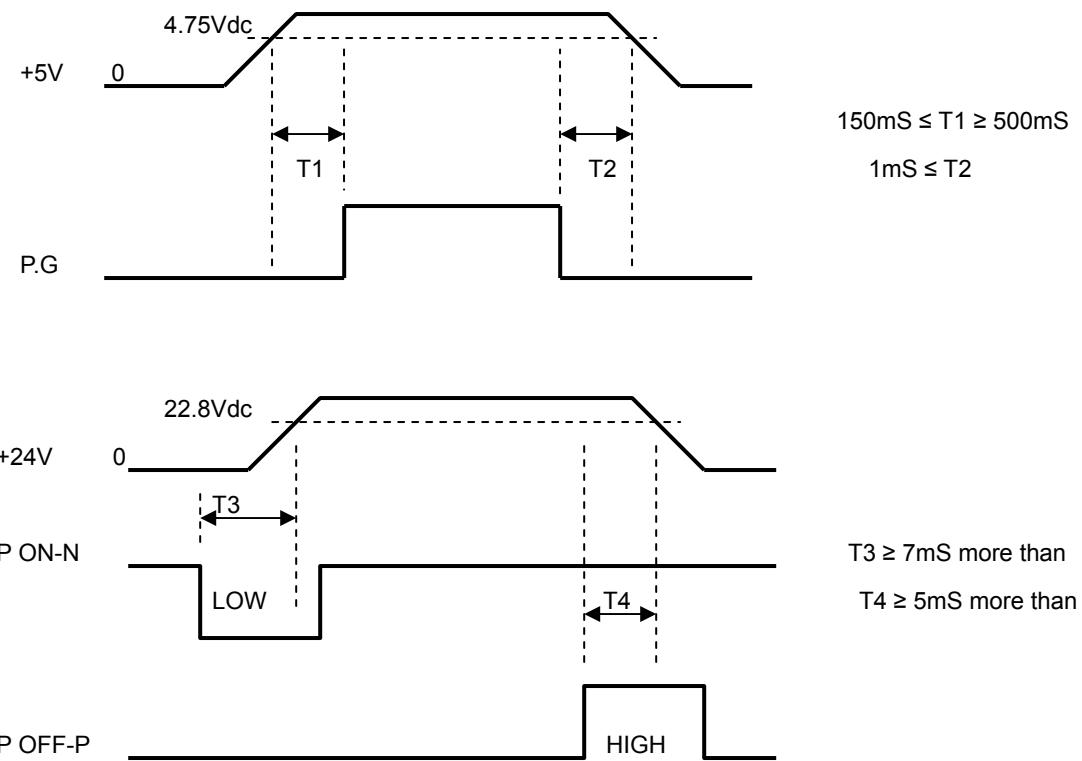


Fig. 10.3 Signal Output Specifications

**MoniMax 5600****10. Power Supply****10.3.8. Connector Configuration**

## 1) AC In

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN-IN	1	L	18AWG/UL1015	BLACK	AMP (1-480701-0)
	2	F.G	18AWG/UL1015	GRN/YEL	
	3	N	18AWG/UL1015	WHITE	

Table 10.8 Connector Configuration

## 2) MBD

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN1	1	S.G	18AWG/UL1007	BLACK	MOLEX (5569-20P)
	2	S.G	18AWG/UL1007	BLACK	
	3	S.G	18AWG/UL1007	BLACK	
	4	S.G	18AWG/UL1007	BLACK	
	5	S.G	18AWG/UL1007	BLACK	
	6	S.G	18AWG/UL1007	BLACK	
	7	+5V	18AWG/UL1007	RED	
	8	+5V	18AWG/UL1007	RED	
	9	+24V	18AWG/UL1007	WHITE	
	10	-5V	18AWG/UL1007	ORANGE	
	11	P-ON-N	18AWG/UL1007	GREEN	
	12	+5VSBV	18AWG/UL1007	PURPLE	
	13	S.G	18AWG/UL1007	BLACK	
	14	S.G	18AWG/UL1007	BLACK	
	15	S.G	18AWG/UL1007	BLACK	
	16	POWER GOOD	18AWG/UL1007	GRAY	
	17	-12V	18AWG/UL1007	BLUE	
	18	+5V	18AWG/UL1007	RED	
	19	+5V	18AWG/UL1007	RED	
	20	+12V	18AWG/UL1007	YELLOW	

Table 10.9 MBD

## 3) SHU

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN3	1	+5V	18AWG/UL1007	RED	MOLEX (5569-08P)
	2	+24V	18AWG/UL1007	WHITE	
	3	+12V	18AWG/UL1007	YELLOW	
	4	S.G	18AWG/UL1007	BLACK	
	5	-12V	18AWG/UL1007	BLUE	
	6	+24V	18AWG/UL1007	WHITE	
	7	S.G	18AWG/UL1007	BLACK	
	8	S.G	18AWG/UL1007	BLACK	

Table 10.10 SHU

**MoniMax 5600****10. Power Supply**

1) PNC

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN6	1	S.G	18AWG/UL1007	BLACK	MOLEX (5569-06P)
	2	S.G	18AWG/UL1007	BLACK	
	3	+12V	18AWG/UL1007	YELLOW	
	4	+24V	18AWG/UL1007	WHITE	
	5	P ON-N	18AWG/UL1007	GREEN	
	6	+5V	18AWG/UL1007	RED	

Table 10.11 PNC

2) MCU

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN10	1	S.G	18AWG/UL1007	BLACK	MOLEX (5569-06P)
	2	S.G	18AWG/UL1007	BLACK	
	3	+12V	18AWG/UL1007	YELLOW	
	4	+24V	18AWG/UL1007	WHITE	
	5	P ON-N	18AWG/UL1007	GREEN	
	6	+5V	18AWG/UL1007	RED	

Table 10.12 MCU

3) +3.3V

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN8	1	+3.3V	16AWG/UL1007	BROWN	MOLEX (5559-02P)
	2	S.G	16AWG/UL1007	BLACK	

Table 10.13 +3.3V Power

4) Battery

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN-BAT	1	BATTERY(+)	18AWG/UL1015	WHITE	AMP (1-480703-0)
	2	BECH-N	18AWG/UL1015	BLACK	
	3	BATTERY(-)	18AWG/UL1015	BLACK	
	4	N.C	-	-	

Table 10.14 Battery

5) OPL

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN11	1	+24V	18AWG/UL1007	WHITE	MOLEX (5569-04P)
	2	+24V	18AWG/UL1007	WHITE	
	3	S.G	18AWG/UL1007	BLACK	
	4	S.G	18AWG/UL1007	BLACK	

Table 10.15 OPL

**MoniMax 5600****10. Power Supply****6) SPL**

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN11	1	+24V	18AWG/UL1007	WHITE	MOLEX (5569-04P)
	2	+24V	18AWG/UL1007	WHITE	
	3	S.G	18AWG/UL1007	BLACK	
	4	S.G	18AWG/UL1007	BLACK	

Table 10.16 SPL

**7) Miscellaneous**

DIVISION	PIN NO.	CONFIGURATION	SIZE	COLOR	REMARK
CN11	1	+24V	18AWG/UL1007	WHITE	MOLEX (5569-04P)
	2	+24V	18AWG/UL1007	WHITE	
	3	S.G	18AWG/UL1007	BLACK	
	4	S.G	18AWG/UL1007	BLACK	

Table 10.17 Miscellaneous

**10.3.9. Power Interface**

PIN NO.	PIN NAME.	ACTIVE (INACTIVE)	DESCRIPTION	IN/OUT
1	P OFF-P	+5V(0V)	Application software turn P/S off	IN
2	S.G	-		-
3	P ON-N	0V(OPEN)	Stand-by switch used to turn P/S on	IN
4	S.G	-		-
5	BATT OFF-N	0V(+5V)	When #7 signal go active CE module Make this signal active then P/S turned off	IN
6	S.G	-		-
7	AC STOP-N	0V(+5V)	When a stoppage of A.C power occur (While U.P.S run) this signal activated	OUT
8	S.G	-		-
9	BATT LOW-N	0V(+5V)	Active of this signal means battery should Replaced, display of error code required	OUT
10	S.G	-		-
11	P OFF-N	0V(OPEN)	Stand-by switch go to off position	OUT
12	N.C	-		-

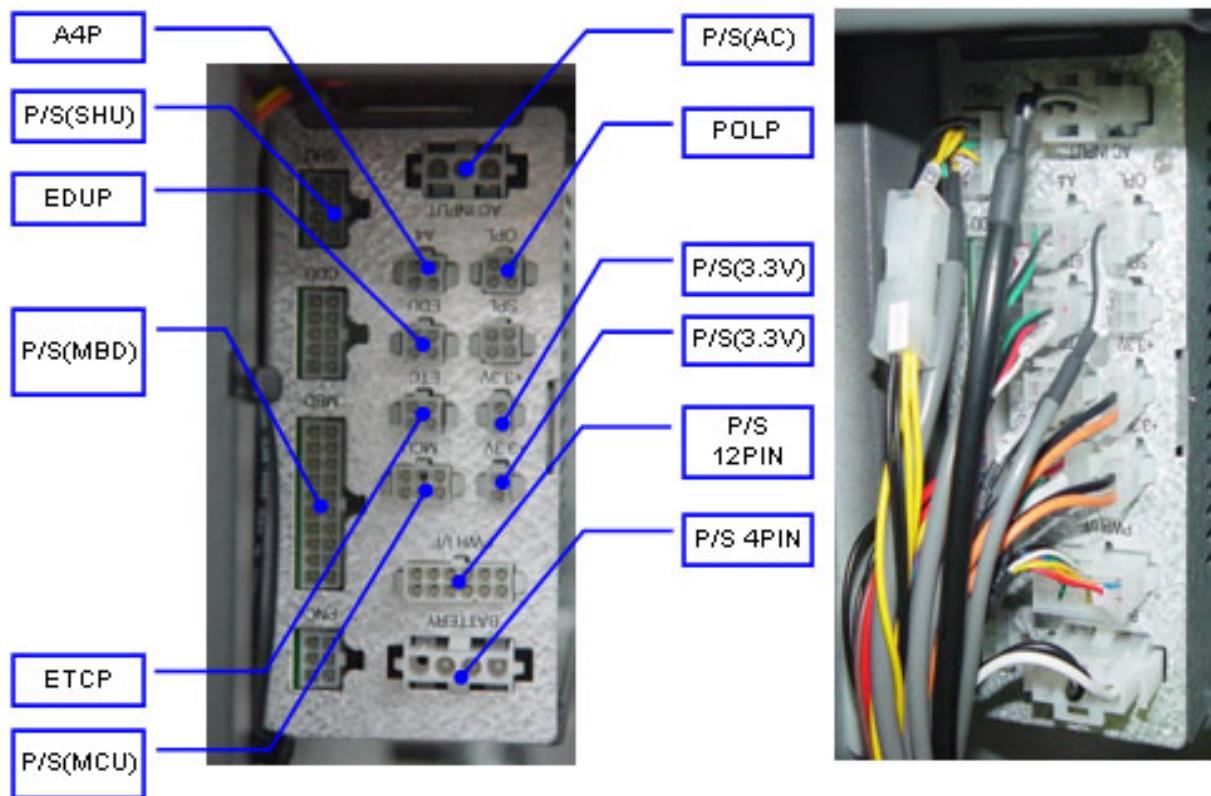
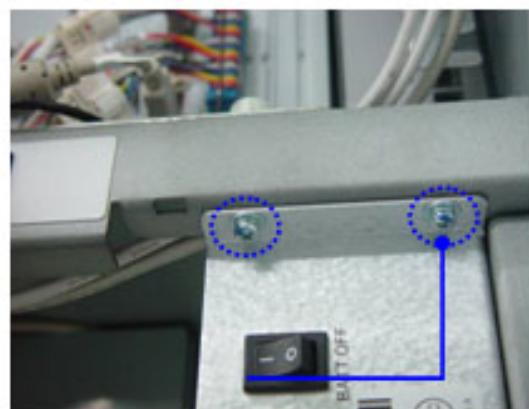
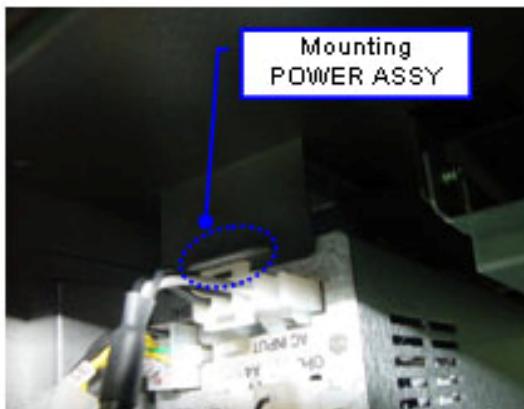
NOTE 1) CABLE UL1007 22AWG

2) CONNECTOR MOLEX 5559-12P

Table 10.18 Power Interface

## 10.4 Power supply assembly

1. Insert Main Power into the Power Assembly Hole.
2. Tighten screws for fixing Power assembly.  
-> (PH(+)) S/W F/W(L) M4X8) - 2 places
3. Insert the connector as pictured below.



## **10.5 Checking power supply status**

### **10.5.1 When the LED for displaying power supply status is off :**

1. Check A.C power
  2. Check Power Cord connection status
  3. Check Main Switch status (I/O)
  4. Check Fuse inside of Power Supply
    - Remove 6 screws on Power Supply Case Cover.
    - Check Fuse (F1, F201) Open/Short inside of Power Supply.
- \* Be sure to check the status after unplugging A.C power cord.

### **10.5.2 When the LED for displaying power supply status is on :**

1. YELLOW(S) LED lights up : Stand-by off or +24Vdc output abnormal status
  - Turn on Stand-by switch.
  - After disassembling D.C output connector, turn on Stand-by switch.
2. RED(P) LED lights up : D.C output abnormal status
  - Switch on if a certain time goes by after turning off main switch.
  - Switch on if a certain time goes by after turning off main switch and disassembling D.C output connector.

## 10.6 Battery

### 10.6.1 Introduction

In case of emergencies like temporary blackout or power failure, battery will automatically operate to warrant completely customer's transaction and return his or her card. In addition, this backup equipment is essential in ATM to protect control electronics installed in ATM for the purpose of finishing application program through normal operation process even though not supporting power regularly

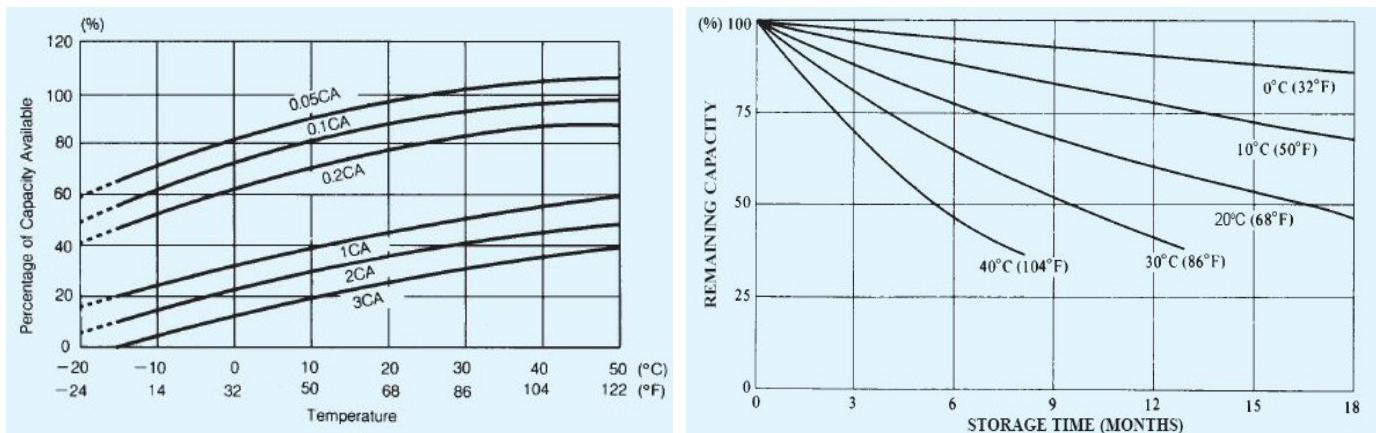


### 10.6.2 Technical Features

- 1) Non-Spillable Sealed Construction
- 2) Absorptive Glass Mat System (AGM System)
- 3) ABS (Acrylonitrile Butadiene Styrene) container and cover
- 4) Gas Recombination
- 5) Maintenance-Free Operation
- 6) Low Pressure Venting System
- 7) Heavy-Duty Grids
- 8) Low Self-Discharge-Long Shelf Life
- 9) Wide Operating Temperature Range
- 10) High Recovery Capability

### 10.6.3 Characteristic curve on environment

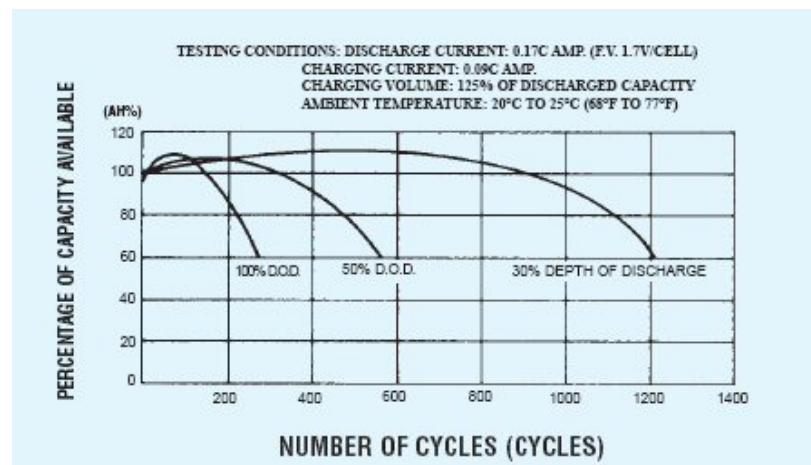
As the ambient temperature rises, the available capacity of battery increase while the capacity decreases as the ambient temperature lowers. The below left figure shows the temperature effects in relation to the battery capacity. In addition, the self-discharge rate of this battery is approximately 3% per month when battery are stored at an ambient temperature of 20°C (68°F). The self-discharge rate varies with ambient temperature. The below right figure shows the relation between the storage time at various temperatures and the remaining capacity



### 10.6.4 Service Life

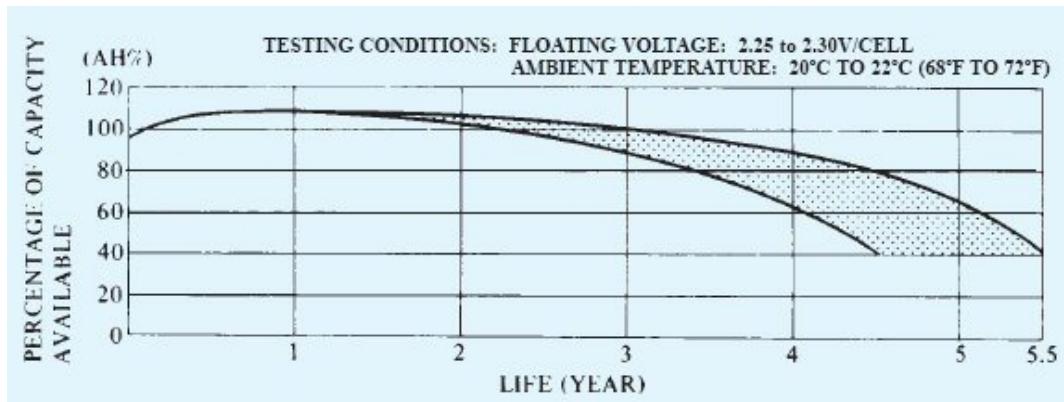
#### 1) Cycle Life

There are a number of factors that affect the length of cyclic life of battery. Major factors are the ambient operating temperature, the discharge rate, the depth of discharge and the manner in which the battery is recharged, of which the most important factor is the depth of discharge. The following figure shows the effects of depth of discharge on cycle life. The relation between the expected number of cycles and the depth of discharge is apparent.



## 2) Float Life

This battery is designed to operate in standby(Float) use up to 5 years on a normal service condition. Following figure shows the float life characteristics of this battery when discharged once every three months up to 100% depth of discharge.



### 10.6.5 Charging method

Proper charging is one of the most important factors when using this battery. Battery performance and service life are directly affected by the charging method used. Followings are the charging instructions recommendable.

#### 1) Standby use

No current limit is required and charging voltage should be in the range of 2.25V/cell ~ 2.30V/cell at 25°C (77F)

#### 2) Cycle use

Maximum charging current is 0.25 and charging voltage is 2.40V/cell to 2.50V/cell at 25°C (77F)

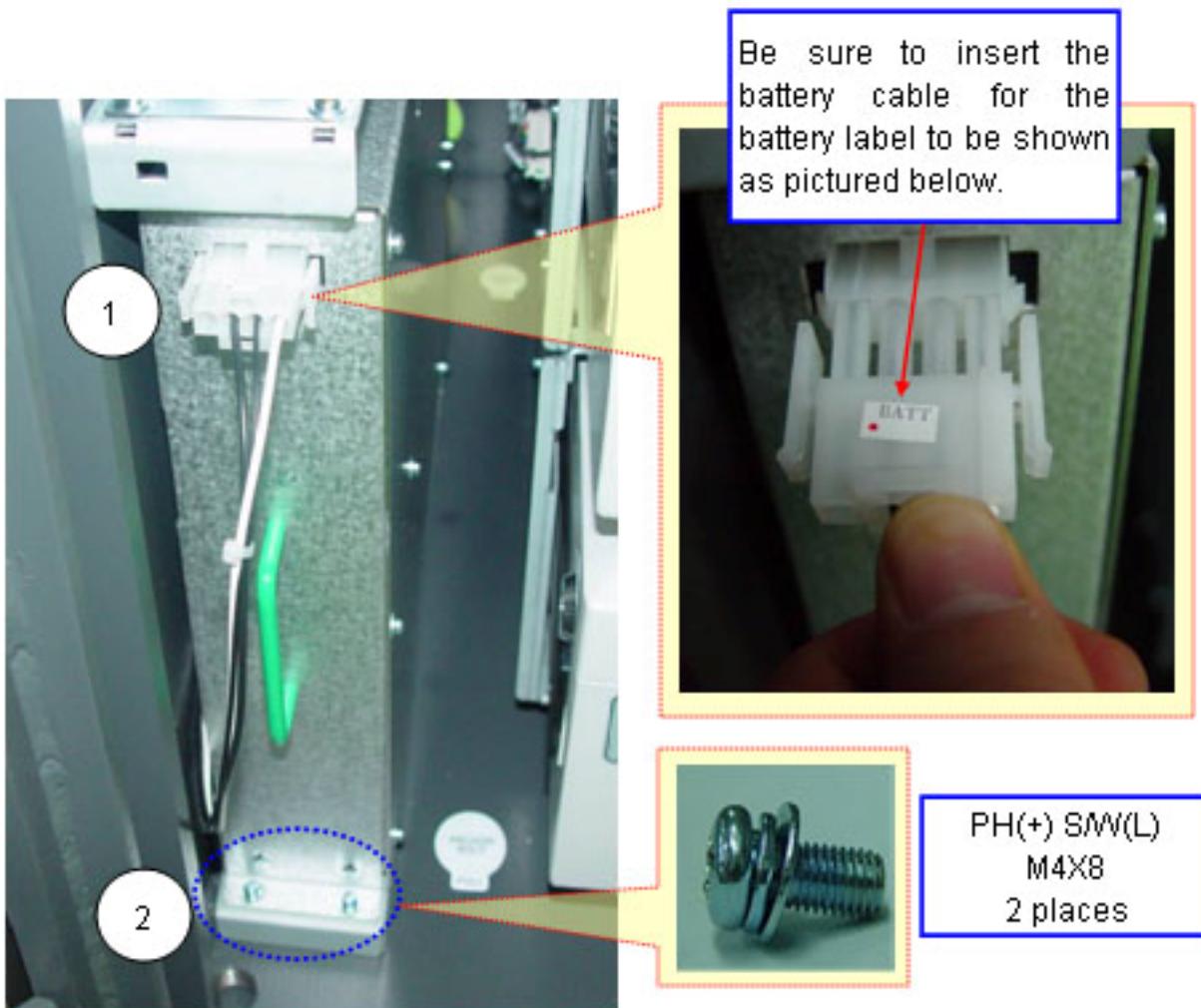
### 10.6.6 Assembling battery assembly

1. Mount the Battery on the lower body.

-> Insert the Battery Cable as pictured below. (Check label.)

2. Screw up 2 fixing screws for Battery.

-> PH(+) S/W(L) M4X8 -2 places



## **Chapter 11. Consumables Specifications**

## 11.1 Receipt Paper

This purchase specification applies to the receipt paper of L-SPR3

### 11.1.1 Specification

Paper type: Thermal roll paper

Print color: Black

### 11.1.2 Specification of the Receipt Paper

Paper type: Thermal roll paper

Print color: Black

Specification: Paper detects heat.

Paper basis weight :  $55\pm3 \text{ g/m}^2$

Paper thickness :  $58\pm4 \mu\text{m}$

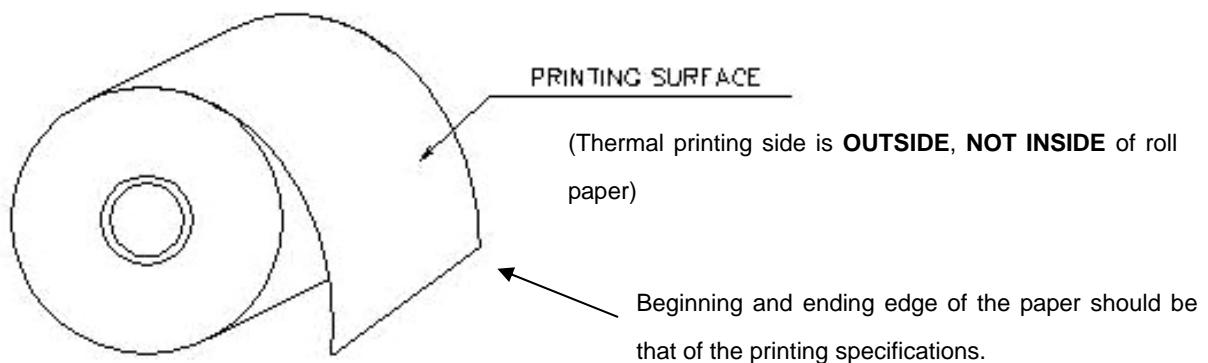


Fig. 11.1 Paper Specifications

### 11.1.3 Roll appearance

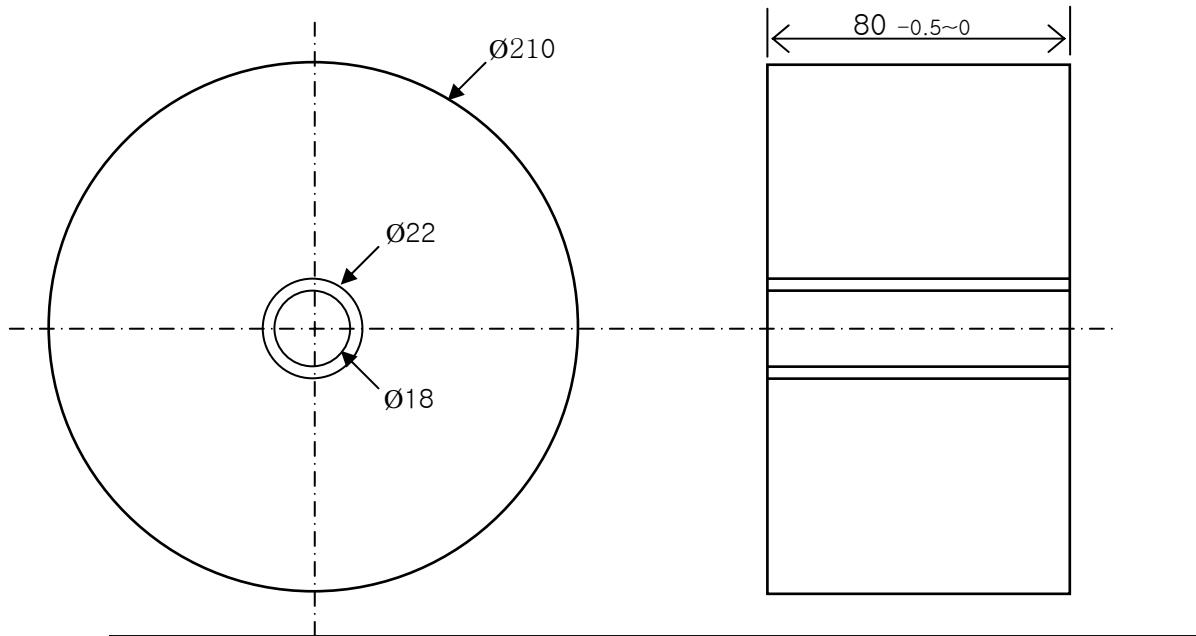


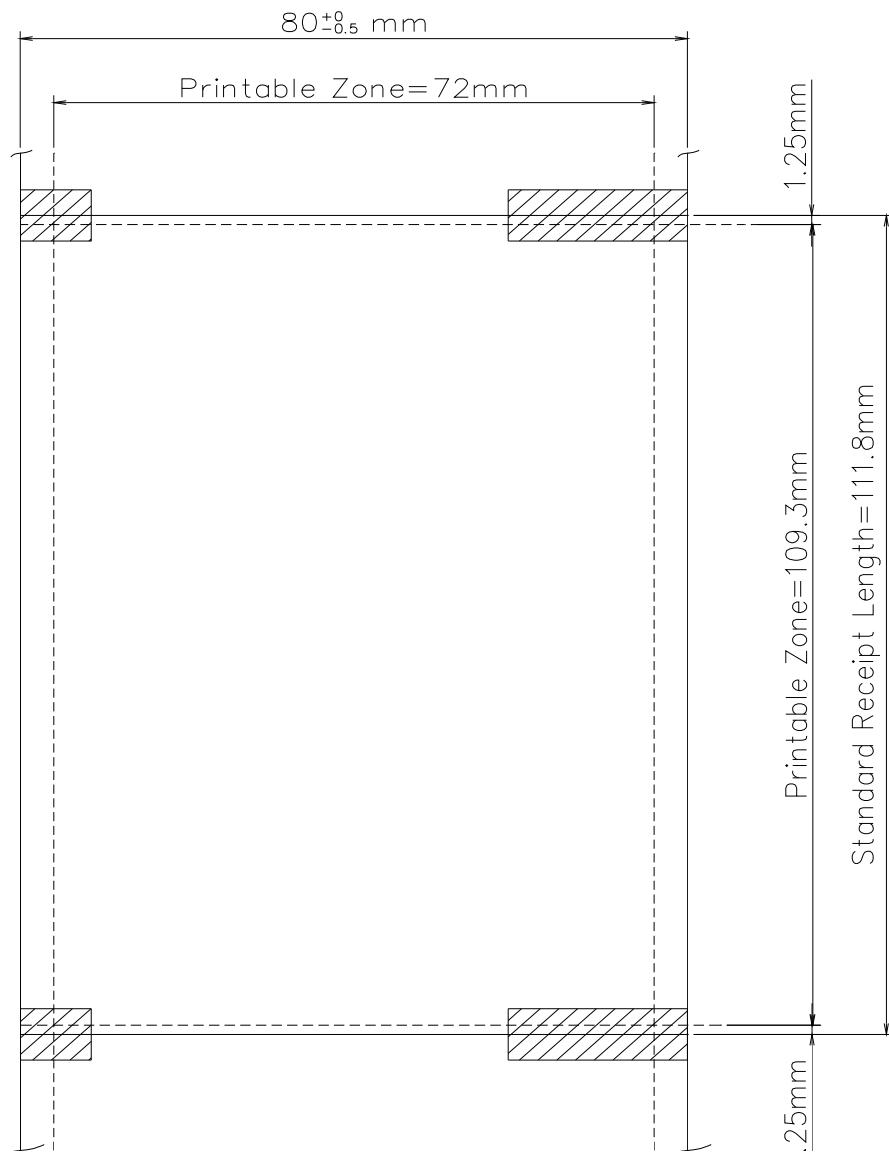
Fig. 11. 2 External roll dimension

- Note 1) Store the paper roll separately to prevent damage to the paper.
- Note 2) Do not connect the papers with tape.
- Note 3) Make sure the paper end is not attached to the paper pipe.
- Note 4) Make sure the paper is rolled evenly.

### 11.1.4 Printing and black mark position

#### 11.1.4.1 Margins and printing area for one slip

Note 1) The vertical margin is  $0.6 \times 10$  mm (0.02 x 0.4 inch).



**MoniMax 5600**

**11. Consumables Specifications**

**11.1.4.2 Printing position of the black mark**

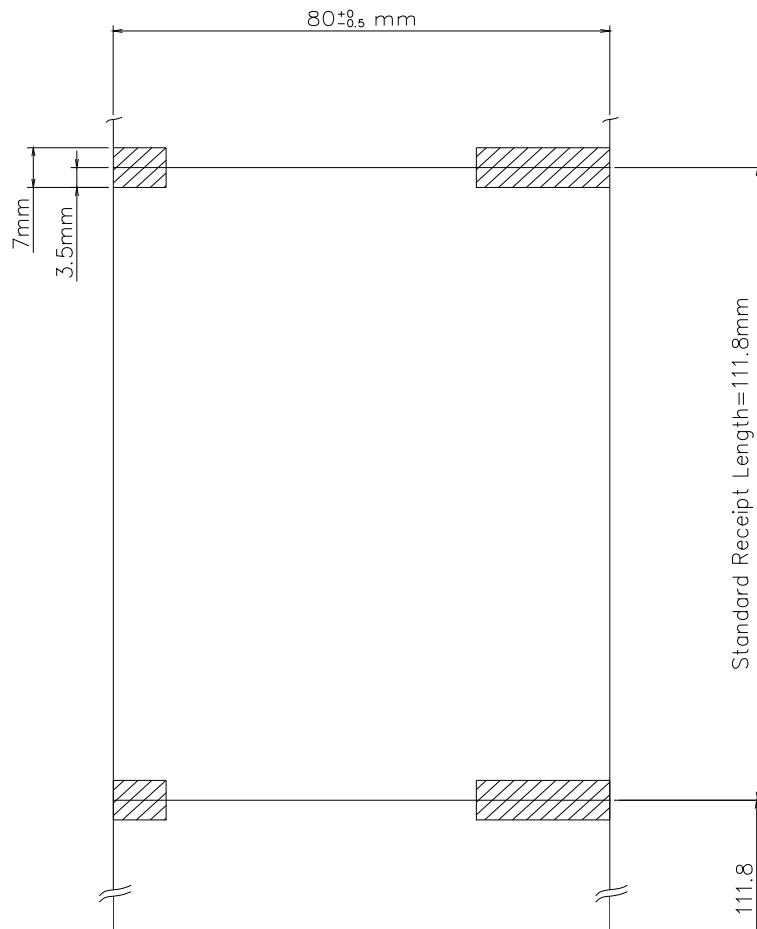


Fig. 11. 3 Printing position of the black mark

### 11.1.5 Printing specification of the black mark

- 1) Use black without dark or bright shades.
- 2) Use the oil ink. (no surface gloss)
- 3) Transmissivity: Less than 10%
- 4) Reflection ratio - PCS 0.9 or higher (Less than Mark GBase PCM II 900nm)
- 5) Thickness should take precedence over reflection ratio.(In case of 55g/m paper, the range of thickness should be between 0.054~0.062 mm)
- 6) The slippery gap between the black mark and the rule mark should be less than 0.5mm .

### 11.1.6 Paper Handling Precautions

- 1) Store it away from high temperature and humidity

If the paper is stored in a place where temperature is above 50°C or humidity is above 90% RH, the coloring capability may deteriorate or the paper surface may inflate.

- 2) Refrain from exposing to direct sunlight

The paper surface can be inflated if you expose it to direct sunlight or leave it under the fluorescent lamp for a long time.

- 3) Keep it away from organic solvents

Paper color may change if the paper comes in contact with organic solvents or glues containing organic solvent.

- 4) Keep it away from plasticizer

If the paper comes in contact with materials containing plasticizer, its coloring capability may deteriorate or de-coloring of the paper may occur.

- 5) Miscellaneous

If the paper comes in contact with carbon copy paper or if the paper surface is scratched with a metallic object, de-coloring may occur.

## 11.2 Magnetic Card

### 11.2.1 Applicable Product

This purchase specification applies to magnetic identification card for MCRW test.

### 11.2.2 Card Specifications

The following table shows the physical specification of the ISO card.

Item	ISO Card (Unit : mm)
<b>Length</b>	
<b>Card Bending</b>	
<b>Magnetic Strip Position</b>	<p>(Card : rear side)</p> <p>Uses third track</p>

Table 11.1 Physical specifications of the ISO magnetic card

## **Chapter 12. Error Code and Troubleshooting**

## **12.1 Troubleshooting**

Most hardware errors occur in electromechanical devices. Electromechanical devices of 7600 include receipt printer (SPR), cash dispensing unit (CDU), dip card reader (MCU), depository (EDU-P), and PIN pad (EPP).

### **• Failures Which May Occur in Receipt Printer (SPR)**

Printer not docked

Bad paper

No power

Paper jam

Defective printer

Cable or cable connections

### **• Failures Which May Occur in Cash Dispensing Unit (CDU)**

CDU not docked

Bill jams

Bad bill picks

Cassette not fully inserted

Sensor pollutions

Bad sensor

Not sensing cassette and/or its type

Purge bin is not sensed

Purge bin full (by putting bad bills or diverted bills by branch personnel)

Defective CDU

Cable and cable connections

### **• Failures Which May Occur in Dip Card Reader (MCR)**

Magnetic head pollutions

Putting the alien substance or papers into card reader

Cable and cable connections

**• Failures Which May Occur in PIN Pad (EPP)**

Cable and cable connections

Wrong key injected

**• Failures Which May Occur During Host Communications**

Communication lines

Cable and cable connections

Network configuration incorrect

Host down

Defective LAN card

Defective CE (Control electronics) main board

## 12.2 Error Code List

### 1) Journal Printer (Option)

Error Code	Cause	Handling
1910000	Undefined error	1.Reinitialized Journal printer and check again
1910400	The error of head right position	1.After checking the head right position, try to reinitialized Journal printer and check again
1910800	The error of Paper charger sub assembly	1.Check the Paper charger and status of supplied paper
1912000	Failed to print due to shortage of CR/LF	1.Check if FFC cable is properly connected or short
1912100	Paper out when checked status of initializing	1.Check if supplied paper is running out of or occurred jam in return path
1914000	Head overheat	1.Turn off the power for a moment to slow down overheat of head and turn on the power
1914100	Paper jam error	1.Remove the jammed paper and initialize
9721010	Failed to connect communication	1.Check if communication cable is properly connected or right status by test machine
9721012	Failed to deliver data to control electronics	1.Check if communication cable is properly connected or right status by test machine
9721016	Failed to receive data from control electronics	1.Check if communication cable is properly connected or right status by test machine
9721040	Failed to produce Thread	
9721080	Failed to produce Event	
9721122	Failed to response of first initialization	
9721123	Failed to response of second initialization	
9721124	Failed to download thd font data	
9721125	Failed to try to print in case of Paper out	

**MoniMax 5600****12. Error Code and Troubleshooting****2) Receipt Printer**

Error Code	Cause	Handling
20101	In case of detecting to be open lever of print head before printing receipt paper	1.Close the lever of print head completely
20102	In case of detecting to be overheated in print head before printing receipt paper	1.Wait the time until the temperature of head adequately slow down and try to initialize
20103	Paper jam occurs in return path before printing or cutting or discharging receipt paper	1.Remove jammed paper between printer head and rollers
20104	It is detected that paper is empty before printing receipt printer	1.Replenish receipt paper 2.Check the status of sensor and its connector
20105	It is detected that paper is not properly set before printing	1.Check the status of setting paper 2.Check the status of sensor and its connector
20106	Command is received while doing self-test	1.After terminating self-test and initialize receipt printer
20107	Receipt paper runs out of before printing	1.Replenish receipt paper in paper charger 2.Check the status of Near End sensor and its connector
20108	It is detected that paper is not properly cut while operating	1.Check the Cutter module 2.Check if printer head lever is properly close
20109	Black mark is not properly detected in receipt paper before printing	1.Check the status of Black mark sensor 2.Check if Dip switch # 6 is correctly set (Dip switch # 6 is set by On in case of not using Black mark)
2010A	The size of image print data is abnormal while printing image	1.Check the AP version and initialize
20801	In case of detecting to be open lever of print head after printing receipt paper	1.Close the lever of print head completely
20802	In case of detecting to be overheated in print head after printing receipt paper	1.Wait the time until the temperature of head adequately slow down and try to initialize
20803	Paper jam occurs in return path after printing or cutting or discharging receipt paper	1.Remove jammed paper between printer head and rollers
20804	It is detected that paper is empty after printing receipt printer	1.Replenish receipt paper

**MoniMax 5600****12. Error Code and Troubleshooting**

Error Code	Cause	Handling
		2.Check the status of sensor and its connector
20805	It is detected that paper is not properly set after printing	1.Check the status of setting paper 2.Check the status of sensor and its connector
20806	Command is received while doing self-test	1.After terminating self-test and initialize receipt printer
20807	Receipt paper runs out of after printing	1.Replenish receipt paper in paper charger 2.Check the status of Near End sensor and its connector
20808	It is detected that paper is not properly cut while operating	1.Check the Cutter module 2.Check if printer head lever is properly close
20809	Black mark is not properly detected in receipt paper after printing	1.Check the status of Black mark sensor 2.Check if Dip switch # 6 is correctly set (Dip switch # 6 is set by On in case of not using Black mark)
2080A	The size of image print data is abnormal while printing image	1.Check the AP version and initialize
97200	Failed to communicate with Receipt printer when connected to SP open	1.Check if communication cable or com port is not connected
2DN00	Failed to connect communication between Receipt printer and SP	1.Check if communication cable or com port is not connected

**MoniMax 5600****12. Error Code and Troubleshooting****3) Card Reader**

Error Code	Cause	Handling
3000000	To shows that received command was undefined	
3000100	To show command parameter error	
3000200	The reception of the command that impossible to implementation	
3000400	To show that error data was included in command	
3000500	To show that a command, which requires the card movement, was executed before IC contacts were released from the card	
3001000	To show that the card was not carried to the specific location after specified number of trial for specified time during execution of command of carrying card in various ways	
3001100	To show that status signal for "shutter open" is not received while shutter is open.	
3001200	To show that the Sensor is damaged or more than one card is inside ICRW.	
3001300	To show that the card longer than 92mm is inserted into ICRW	
3001400	To show that the card shorter than 78mm is inserted into ICRW	
3001500	To show that data in F-ROM is damaged	
3001600	To show that the card staying inside ICRW was moved up to the point where status request information change. To show that card was inserted into the ICRW through rear side by external force	
3001700	To show that the card was not carried to the specific location after specified number of trial for specified time during execution of RETRIEVE command.	
3001800	To show that shutter open/close detection sensor(SW2) and card width check sensor(SW1) are not operating correctly.	
3001900	To show that a card was not inserted from the rear, even if 10 seconds had passed	

**MoniMax 5600****12. Error Code and Troubleshooting**

Error Code	Cause	Handling
	after the execution of BACK ENTRY command	
3002000	To show that track has parity error	
3002100	To show that read error has happened in Multiple magnetic read command.	
3002200	To show that write error is detected through write/verify procedure.	
3002300	To show that only SS,ES,LRC are contained in the track. (no retry)	
3002400	To show that the card has no magnetic track(no retry)	
3002500	To show that quality error(Jitter,Preamble,Postamble) has happened in write verify.	
3002600	To show that the track has no SS.	
3002700	To show that the track has no ES	
3002800	To show that the track has no LRC error	
3002900	To show that the discordance of write data has happened in write verify.	
3003000	To show that power down(or power cut in short instant)is detected(or being detected).	
3003100	To show that DSR signal was turned to OFF(communication is cut)	
3004000	To show that the card was pulled out form ICRW through entrance date when CAPTURE command is being executed.	
3004100	Failure at IC Contact solenoid or sensor ICD.	
3004300	Card could not be set to IC contact position/Failure at sensor PDI.	
3004500	ICRW lost sight of the card when ICRW completed to carry the card to the rear position during the card acceptance, and ICRW ejected the card to entrance gate.	
3004600	To show that the ejected card has not been withdrawn during execution of Monitoring for removal command.	
3005000	Retract counter overflow.	
3005100	To show that Motor error has happened, through start/stop check in Initialize command.	

**MoniMax 5600****12. Error Code and Troubleshooting**

Error Code	Cause	Handling
3005300	To show that read error in Digital Decode Read Command.	
3006000	To show that there found abnormal condition on the power-line.	
3006100	The receiving error for ATR.	
3006200	To show that the specified protocol does not agree with that of ICC/SAM ICRW still connected.	
3006300	In case T=1 cards, after ATR receiving, IFS exchange is failed. ICRW detects time out.	
3006400	In case T=1 cards, after ATR receiving, IFS exchange is failed. ICRW detects protocol error.	
3006500	HOST tried to communicate with IC card without card activation.	
3006600	ICRW tried to activate with ICC/SAM, but the card returned ATR, which is not supported.	
3006900	ICRW tried to activate with ICC/SAM, but the card returned ATR, Which does not match EMV.	
3007000	Failure at F-ROM operation.	
3007100	Firmware of User program code area is wrong.	
300B000	Received the other command before executing Initialize command.	
9723016	Response time out error	
9723017	Send command time out error	
9723019	Polling down	

**4) Cash Dispenser**

Error Code	Cause	Handling
40000	Received a command that the CDU does not have from the upper unit	1. Check the CDU received command 2. Check the CDU firmware version and refer to specifications.
40011	CS2 Dark detection during initializing or dispense reserved operation (Reject box mounting/dismounting)	1. Initialize after mounting the reject box. 2. Check if the CS2 sensor cable is disconnected 3. Exchange a sensor after abnormal operating CS2 Sensor
40012	CS3 Dark detection during initializing or Dispense reserved operation	1. Remove the remaining notes or foreign objects on the gate 2. Check if the CS3 sensor bracket is bended. 3. Check if the CS3 sensor cable is disconnected 4. Exchange a sensor after abnormal operating CS3 Gate detecting sensor.
40013	CS2 and CS3 Dark detection during initializing or dispense reserved operation	The same as #40011 and #40012 error handling
40014	CS4A Dark detection during initializing or dispense reserved operation	1. Remove the remaining notes and foreign objects at the position of the CS4A sensor 2. Check if the CS4A sensor cable is disconnected 3. Exchange a sensor after abnormal operating the CS4A Sensor
40015	CS2 and CS4A Dark detection during initializing or dispense reserved operation	The same as #40011 and #40014 error handling
40016	CS3 and CS4A Dark detection during initializing or dispense reserved operation	The same as #40011 and #40012 error handling
40017	CS2, CS3 and CS4A Dark detection during initializing or dispense reserved operation	The same as #40011, #40012 and #40014 error handling
40018	CS4B Dark detection during initializing or dispense reserved operation	1. Remove the remaining notes and foreign objects at the position of the CS4B sensor 2. Check if the CS4B sensor cable is disconnected 3. Exchange a sensor after abnormal operating the CS4B sensor
40019	CS2, CS4B Dark Detection during In Initializing or Dispense reserved operation	The same as #40011 and #40018 error handling
4001A	CS3 and CS4B Dark detection during initializing or dispense reserved operation	The same as #40011 and #40018 error handling
4001B	CS2, CS3 and CS4B Dark detection during initializing or dispense reserved operation	The same as #40011, #40012 and #40018 error handling
4001C	CS4A and CS4B Dark detection during initializing or dispense reserved operation	The same as #40014 and #40018 error handling

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Error Code	Cause	Handling
4001D	CS2, CS4A and CS4B Dark detection during initializing or dispense reserved operation	The same as #40011, #40014 and #40018 error handling
4001E	CS3, CS4A and CS4B Dark detection during initializing or dispense reserved operation	The same as #40012, #40014 and #40018 error handling
4001F	CS2, CS3, CS4A and CS4B Dark detection during initializing or dispense reserved operation	The same as #40011, #40012 and #40014 error handling
40021	CS11A Dark detection during initializing or dispense reserved operation	<ol style="list-style-type: none"> <li>1. Remove the remaining notes and foreign objects at the position of the CS11A sensor</li> <li>2. Check if the CS11A sensor cable is disconnected.</li> <li>3. Exchange a sensor after abnormal operating the CS11A sensor</li> </ol>
40022	CS11B Dark detection during initializing or dispense reserved operation	<ol style="list-style-type: none"> <li>1. Remove the remaining notes and foreign objects at the position of the CS11B sensor</li> <li>2. Check if the CS11B sensor cable is disconnected</li> <li>3. Exchange a sensor after abnormal operating the CS11B sensor</li> </ol>
40023	CS11A and CS11B Dark detection during initializing or dispense reserved operation	The same as #40021 and #40022 error handling
40028	CS13 Dark detection during initializing or Dispense reserved operation	<ol style="list-style-type: none"> <li>1. Remove the remaining notes and foreign objects at the position of the CS13 sensor</li> <li>2. Check if the CS13 sensor cable is disconnected (CDU Board CN10 #1~4).</li> <li>3. Exchange sensor if error occurs after checking CS13 sensor operation</li> </ol>
40029	CS11A and CS13 Dark detection during initializing or dispense reserved operation	The same as #40021 and #40028 error handling
4002A	CS11B and CS13 Dark detection during initializing or dispense reserved operation	The same as #40022 and #40028 error handling
4002B	CS11A, CS11B and CS13 Dark detection during initializing or dispense reserved operation	The same as #40021, #40022 and #40028 error handling
40030	Main motor echo check(Initial recovery)	<ol style="list-style-type: none"> <li>1. Initialize</li> <li>2. Check Main Motor Encoder Slit</li> <li>3. Initialize after Power On/Off</li> <li>4. Check Encoder Sensor CS8 BRKT</li> <li>5. Check CS8 Sensor Cable</li> <li>6. Change Main Motor Encoder Slit Sensor CS8</li> </ol>
40033	Check sum error (No information is set) (Initial recovery)	<ol style="list-style-type: none"> <li>1. Check CDU Information after reading CDU version</li> <li>2. Initialize</li> <li>3. Initialize after executing CDU Information Set('P') Command</li> <li>4. Change CDU B/D</li> </ol>

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Error Code	Cause	Handling
40034	Error two sheets detecting sensor(CS5_1) for initializing	1. Check CS5_1 Sensor Cable 2. Check second Dip Switch in CDU B/D 3. Change CS5_1 Sensor
40035	Error two sheets detecting sensor(CS5_2) for initializing	1. Check CS5_2 Sensor Cable 2. Check second Dip Switch in CDU B/D 3. Change CS5_2 Sensor
40037	Error 2 sheets detecting sensor(CS5_1/CS5_2) for dispensing	1. Check CDU Board Segment 2. Initialize 3. Read data of 'Read Double Sensor' Command
40038	The cash dispenser module is deviated from the right position	1. Push CDU module inside completely until it is locked
40039	Gate operation sensor (CS3) error before initial recovery	1. Initialize after removing notes or dust over Gate 2. Check CS3 Sensor BKRT 3. Check CS3 Sensor Cable 4. Exchange Sensor after abnormal operating CS3 Gate detecting Sensor 5. Exchange Reject Solenoid 1
4003A	When more than 5 sheets of cash dispensing is required during a test	1. Check command that CDU is received 2. Check CDU EP ROM Version or specification
4003B	CS21A dark detected (Initial recovery, On separated reject)	1. Remove notes or dust in existence CS21A Sensor 2. Check CS21A Sensor Cable 3. Exchange Sensor after abnormal operating CS21A Sensor
4003C	No cassette, during rejecting separated cassette (Separated reject)	1. Set 1 Cassette 2. Check CS7 Sensor Cable 3. Exchange Sensor after abnormal operating CS7 Sensor
4003D	Dismount during rejecting separated cassette (Separated reject)	1. Check notes in 1Cassette 2. Check 1 Cassette specification 3. Check CS7 Sensor Cable 4. Exchange Sensor after abnormal operating CS7 Sensor
4003E	CS21B DARK Detected (Initial recovery, Separated reject)	1. Remove notes or dust in existence CS21B Sensor 2. Check CS21B Sensor Cable 3. Exchange Sensor after abnormal operating CS21B Sensor
4003F	CS21A,CS21B DARK Detected(Initial recovery, Separated reject)	1. Remove notes or dust in existence CS21A , CS21B Sensor 2. Check CS21A, CS21B Sensor Cable 3. Exchange sensor after abnormal operating CS21A, CS21B Sensor
40041	Error if re-driving is over 12 times (Separated rejection)	1. Check notes in Reject Box 2. Rearrange notes in Cassette 3. Remove dust in CS21AB, CS31AB, CS41AB CS11AB Sensor 4. Check dust existing in CS5 Sensor Guide 5. Check dust existing in Main Motor Encoder Slit 6. Check index value of notes each cassette
40042	CS13 < Required Notes(Separated rejection)	1. Check notes dispensed and rejected 2. Remove notes jammed in CDU

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Error Code	Cause	Handling
		3. Remove dust in CS13 Sensor 4. Exchange sensor after abnormal operating CS13 Sensor
40043	Error if total reject is more than 40 sheets(Separated rejection)	1. Check notes in Reject Box 2. Rearrange notes in Cassette 3. Remove dust in CS11AB, CS21AB, CS31AB, CS41AB Sensor 4. Check dust in existence CS5 Sensor Guide 5. Check notes index value
40044	Reject error if continuous 10 times (Separated rejection)	1. Check notes in Reject Box 2. Rearrange notes in Cassette 3. Check dust in Main Motor Encoder Slit 4. Remove dust in CS21AB, CS31AB, CS11AB Sensor 5. Exchange CS8 Encoder Slit Sensor
40045	CS13 > required sheet(Separated rejection)	1. Check notes dispensed and rejected 2. Remove dust in CS13 Sensor 3. Exchange sensor after abnormal operating CS13 Sensor
40046	Program error(Separated rejection)	1. Initialize after Reset Power 2. Upgrade CDU Firmware or Re-download 3. Exchange CDU B/D
40047	1 CASSETTE MISFEED ERROR(Separated rejection)	1. Check notes in 1 Cassette 2. Check Sensor(CS6) Poll 3. Check jam in 1 cassette and reload 4. Remove dust in CS11A, CS11B Sensor 5. Exchange 1 cassette box when there are many error
40049	Dispensing 0 sheets required is error(Separated rejection)	1. Check received command 2. Check communication cable 3. Check CDU Firmware Version
4004A	TIME OUT (JAM)(Separated rejection)	1. Remove jammed notes on CDU return path 2. Remove dust in CS11AB, CS21AB, CS31AB, CS41AB, CS4AB, CS13 Sensor 3. Install after rearranging notes in cassette
4004B	Continuous 10 times error if note is long	1. Check state of notes in reject box 2. Rearrange notes in cassette 3. Check Index of notes 4. Check foreign objects in the main motor encoder slit. 5. Replace the CS8 encoder slit sensor
4004E	Detected the remaining notes during dispense reserved operation	1. Initialize after removing the return path 2. Clean sensors on the return path (CS13)
40051	Received a request for over 121 notes dispensing on the CDU from the upper unit.	1. Check the CDU received command 2. Check the abnormal communication cable. 3. Check the CDU firmware version and refer to specifications.
40052	The remaining notes at the sensor in front of the CST after dispense operation (CS11AB, CS21AB, CS31AB, CS41AB)	1. Remove the remaining notes at a sensor in front of the CST 2. Realign notes in the cassette 3. Check abnormal clutch.

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Error Code	Cause	Handling
		4. Check abrasion of the cassette box pick unit.
40054	CDU EP Program Error during dispense operation (failed table search)	1. Initialize after resetting the power 2. Upgrade the CDU firmware or re-download software 3. Replace the CDU B/D
40055	Timeout due to note's length error passed through the CS13 during dispense operation	1. Remove a jammed note between the tray and CDU 2. Remove a jammed note at the position of the CS13 sensor 3. Remove a dust on the CS13 sensor
40056	Abnormal operation of the gate solenoid 1 during dispense operation.	1. Remove a jammed note on the gate 2. Remove notes in the reject box and remount the reject box 3. Check if the CS3 sensor bracket is bended. 4. Check if the CS3 sensor cable is disconnected 5. Exchange a sensor after abnormal operating CS3 Gate detecting sensor. 6. Replace the reject solenoid 1
40057	Sum check error of note index setting value in the CDU CST of EEPROM during initializing	1. Read the CDU version to check CDU CST note index 2. Reinitialize 3. Initialize after executing the CDU Information Set('P') Command 4. Replace the CDU board
40059	2 Cassette not available during dispense reserved operation	1. Mount 2 cassette 2. Check if the CS17 sensor cable is disconnected . 3. Exchange a sensor after abnormal operating the CS17 sensor .
4005A	Mounting/demounting 2 Cassette during dispense operation	1. Check notes' status in 2 Cassette 2. Check 2 cassette specifications 2. Check if the CS17 sensor cable is disconnected 4. Exchange a sensor after abnormal operating the CS17 sensor .
4005B	2 Cassette miss feed during dispense operation	1. Check the remaining notes in 2 Cassette 2. Check if the remaining note sensor (CS16) is normal 3. Check a jammed note in 2 Cassette or remount it 4. Remove the dust on the CS21A and CS21B Sensors 5. Replace @ cassette box when multiple error occurs
4005C	Sensor dark in front of the CST except dispensing during dispense operation	1. Remove a dust and foreign objects on CS11AB, CS21AB, CS31AB and CS41AB sensors. 2. Check the clutch operation (Life test command) 3. Check specifications of 3 Cassette FM Board Dip Switch (#2, #4, #6 On) 4. Check specifications of 4 Cassette FM Board Dip Switch (#3, #5, #6 On)
4005D	Continuously detected 2 notes for three times or more during dispense operation	1. Check notes' status in the reject box 2. Realign notes in the cassette

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Error Code	Cause	Handling
		3. Check foreign objects at the position of the CS5 Sensor Guide 4. Check if the CS5 cable is disconnected
40081	Received the wrong shutter command from the upper unit.	1. Check the CDU received command 2. Check the abnormal communication cable. 3. Check the CDU firmware version and refer to specifications.
40082	Failed to open the CDU shutter (failed ten times retry)	1. Remove foreign objects in the shutter unit. 2. Check the shutter motor connection cable. 3. Check a connection status of the TS004 and TS005 sensor 4. Check the shutter cam operation.
40084	Failed to close the CDU shutter (failed ten times retry)	1. Remove foreign objects in the shutter unit. 2. Check the shutter motor connection cable. 3. Check a connection status of the TS004 and TS005 sensor. 4. Check the shutter cam's rotation operation.
40085	When the command of CDU shutter open or close is received in case of not being set CDU shutter.	
40087	Error failed to communicate with CDU shutter	
40088	Error occurs when cassette with ID is not mounted	
40089	Error occurs when the number of dispensed bills from cassette don't match the number of detection by sensor	
4008A	CS11AB Dark detection on transport path before dispense operation	1. Remove the remaining notes and foreign objects at the position of the CS11AB sensor 2. Check if the CS11AB sensor cable is disconnected 3. Exchange a sensor after abnormal operating the CS11AB sensor
4008B	CS21AB Dark detection on transport path before dispense operation	1. Remove the remaining notes and foreign objects at the position of the CS21AB sensor 2. Check if the CS21AB sensor cable is disconnected 3. Exchange a sensor after abnormal operating the CS21AB sensor
4008C	CS31AB Dark detection on transport path before dispense operation	1. Remove the remaining notes and foreign objects at the position of the CS31AB sensor 2. Check if the CS31AB sensor cable is disconnected 3. Exchange a sensor after abnormal operating the CS31AB sensor
4008D	CS41AB Dark detection on transport path before dispense operation	1. Remove the remaining notes and foreign objects at the position of the CS41AB sensor 2. Check if the CS41AB sensor cable is disconnected 3. Exchange a sensor after abnormal operating the CS41AB sensor

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Error Code	Cause	Handling
4008E	CS4B Dark detection on transport path before dispense operation	1. Remove the remaining notes and foreign objects at the position of the CS4 sensor 2. Check if the CS4 sensor cable is disconnected 3. Exchange a sensor after abnormal operating the CS4 sensor
4008F	Error occurs when CS13 sensor regard hole in bill as wrong	
40090	Mismatched number of check sheets	1. Check dispensed check and reject check. 2. Remove a jammed note on the CDU. 3. Remove a dust or foreign objects on the CS13 sensor 4. Exchange a sensor after abnormal operating the CS13 sensor . ※ Reset number of check sheets after troubleshooting.
40091	Reject error due to check skew during check dispense operation.	1. Check a check's status in the reject box 2. Remove a dust and foreign objects on the CS31AB or CS41AB sensors. 3. Check the CIU Module Print Head. 4. Realign check sheets in the check cassette box. ※ Reset number of check sheets after troubleshooting.
40092	Reject error due to abnormal check interval skew during check dispense operation.	1. Check a check's status in the reject box 2. Remove a dust and foreign objects on the CS31AB or CS41AB sensors. 3. Check the CIU Module Print Head. 4. Realign check sheets in the check cassette box. 5. Clean the pick up roller in the check cassette box. ※ Reset number of check sheets after troubleshooting.
40093	Reject error due to long check sheet during check dispense operation.	The same as #40092 handling.
40094	Reject error due to short check sheet during check dispense operation.	The same as #40092 handling.
40095	Reject error due to 2 check sheets' pick up during check dispense operation	The same as #40092 handling.
40096	Reject error due to the abnormal half of check during check dispense operation.	The same as #40092 handling.
40097	Reject error due to abnormal check separation interval skew during check dispense operation.	The same as #40092 handling.
40098	Abnormal CIU detecting sensor during check dispense operation	1. Clean CS31AB and CS41AB, or remove foreign objects. 2. Check if the FM Board (3 CST or 4 CST) CN3 and CIU Sensor Cable are connected.
40099	CIU communications response timeout error during check dispense reserved operation or initializing.	1. Reinitialize 2. Check if the CIU communications serial cable is connected. 3. Check if the CIU power cable is connected.

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Error Code	Cause	Handling
4009A	CIU communications response timeout error during check dispense reserved operation or initializing.	The same as #40099 handling.
4009B	Detected the CS31A and CS31B Dark during initializing or dispense reserved operation	<ol style="list-style-type: none"> <li>1. Remove the remaining notes and foreign objects at the position of the CS31A and CS31B sensors.</li> <li>2. Check settings of 3 Cassette FM Board Dip Switch (#2, #4, #6 On)</li> <li>3. Check if the CS31 and CS31B Sensor Cable are disconnected</li> <li>4. Exchange a sensor after abnormal operating the CS31A, CS31B sensor</li> </ol>
4009C	Detected the CS31B Dark during initializing or dispense reserved operation	<ol style="list-style-type: none"> <li>1. Remove the remaining notes and foreign objects at the position of the CS31B sensor.</li> <li>2. Check settings of 3 Cassette FM Board Dip Switch (#2, #4, #6 On)</li> <li>3. Check if the CS31B and CS31B sensor cables are disconnected</li> <li>4. Exchange a sensor after abnormal operating the CS31B.</li> </ol>
4009D	3 Cassette not available during dispense reserved operation	<ol style="list-style-type: none"> <li>1. Mount 3 cassette</li> <li>2. Check if the CDU Board CN6 and 3 Cassette FM Board CN1 are connected.</li> <li>3. Check settings of 3 Cassette FM Board Dip Switch (#2, #4, #6 On)</li> <li>4. Check if the CS37 sensor cables are disconnected (3 CST FM B/D CN3).</li> <li>5. Exchange a sensor after abnormal operating the CS37 sensor .</li> </ol>
4009E	Mounting/demounting 3 Cassette during dispense operation	<ol style="list-style-type: none"> <li>1. Check notes' status in 3 Cassette</li> <li>2. Check 3 cassette specifications</li> <li>2. Check if the CDU Board CN6 and 3 Cassette FM Board CN1 are connected.</li> <li>3. Check settings of 3 Cassette FM Board Dip Switch (#2, #4, #6 On)</li> <li>4. Check if the CS37 sensor cable are disconnected (3 CST FM B/D CN3).</li> <li>5. Exchange a sensor after abnormal operating the CS37 sensor .</li> </ol>
4009F	3 Cassette miss feed during dispense operation	<ol style="list-style-type: none"> <li>1. Check the remaining notes in 3 Cassette</li> <li>2. Check if the remaining note sensor (CS36) of 3 Cassette is normal.</li> <li>3. Check a jammed note in 3 Cassette or remount it</li> <li>4. Remove the dust on the CS31A and CS31B Sensors</li> <li>5. Replace 3 cassette box when multiple errors occur.</li> </ol>
400A1	Detected the CS9 Dark in Reject(Retракт) box during initializing.	<ol style="list-style-type: none"> <li>1. Open the reject/retract box cover</li> <li>2. Check if the CS9 sensor cable is disconnected.</li> <li>3. Exchange a sensor after abnormal operating the CS9 sensor</li> </ol>
400A2	When a note doesn't arrive from the tray to the throat entrance (CS10AB~CS14 (Delivery Jam)).	<ol style="list-style-type: none"> <li>1. Remove a jammed note or foreign objects between the throat and the tray</li> <li>2. Check if the CS10AB and CS14 sensor cable is</li> </ol>

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Error Code	Cause	Handling
		disconnected. 3. Check the feed motor operation in the throat unit. 4. Exchange a sensor after abnormal operating the CS14 sensor .
400A7	When cam doesn't arrive at dispense position within regulated time (cam error)	
400A8	When cam doesn't arrive at delivery position within regulated time (cam error)	
400AA	Failed during writing EEPROM data	1. Retry after initialization. 2. Replace the CDU Board.
400AB	Disable to drive due to the remaining notes in the tray during initializing or dispense reserved operation.(CS10A and CS10B Dark detection)	1. Remove the remaining notes or foreign objects in the tray. 2. Check if holders on the CS10A and CS10B sensors are bended. 3. If error occurs when checking CS10A/CS10B (CDU B/D CN2 #17~24) disconnection and operation, replace a sensor.
400AD	Disable to detect notes in CS15 sensor during delivery operation	1. Remove the remaining notes on the throat. 2. If error occurs when checking CS15 disconnection and operation, replace a sensor.
400AE	No note in the tray before delivery or retract operation.	1. If error occurs when checking CS (CDU B/D CN2 #17~24) disconnection and operation, replace a sensor. 2. Check the tray deliver position operation.
400AF	Received the wrong life test command from the upper unit.	1. Check the CDU received command 2. Check the abnormal communication cable. 3. Check the CDU firmware version and refer to specifications.
400B0	Opened shutter during dispense operation.	1. Check the shutter cam's rotation. 2. If error occurs when checking TS004 disconnection and operation, replace a sensor.
400BA	CS1 sensor of reject box entrance is detected as dark during initialization or before dispense operation	
400BB	Bill jam on CS1 sensor of reject box entrance during dispense operation	
400BC	Communication error-Command Length doesn't match.	
400BD	Bill rejection error (Normal recognition for short bill-CS4)	
400BE	Bill rejection error (Normal recognition for long bill-CS4)/CS4 Jam.	
400C1	1 Cassette Jam during dispense operation (1 CST Encoder Error).	1. Remove a jammed note in 1 Cassette. 2. Mount 1 cassette box after realigning notes in 1 cassette box. 3. Remove foreign objects on 1 Cassette Clutch Encoder Slit. 4. Replace 1 cassette box when multiple errors occur.

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Error Code	Cause	Handling
400C2	2 Cassette Jam during dispense operation (2 CST Encoder Error).	<ol style="list-style-type: none"> <li>1. Remove a jammed note in 2 Cassette.</li> <li>2. Mount 2 cassette box after realigning notes in 1 cassette box.</li> <li>3. Remove foreign objects on 2 Cassette Clutch Encoder Slit.</li> <li>4. Replace 2 cassette box when multiple errors occur.</li> </ol>
400C3	3 Cassette Jam during dispense operation (3 CST Encoder Error).	<ol style="list-style-type: none"> <li>1. Remove a jammed note in 3 Cassette.</li> <li>2. Mount 3 cassette box after realigning notes in 1 cassette box.</li> <li>3. Remove foreign objects on 3 Cassette Clutch Encoder Slit.</li> <li>4. Replace 3 cassette box when multiple errors occur.</li> </ol>
400C4	4 Cassette Jam during dispense operation (4 CST Encoder Error).	<ol style="list-style-type: none"> <li>1. Remove a jammed note in 4 Cassette.</li> <li>2. Mount 4 cassette box after realigning notes in 1 cassette box.</li> <li>3. Remove foreign objects on 4 Cassette Clutch Encoder Slit.</li> <li>4. Replace 4 cassette box when multiple errors occur.</li> </ol>
400C7	CS 14 Dark detection during initializing or dispense reserved operation.	<ol style="list-style-type: none"> <li>1. Remove the remaining notes and foreign objects at the position of the CS 14 sensor</li> <li>2. If error occurs when checking CS 14 disconnection and operation, replace a sensor.</li> </ol>
400C8	CS 15 Dark detection during initializing or dispense reserved operation.	<ol style="list-style-type: none"> <li>1. Remove the remaining notes and foreign objects at the position of the CS 15 sensor</li> <li>2. If error occurs after checking CS 15 disconnection and operation, replace a sensor.</li> </ol>
400CA	CS14 Dark detection during deliver reserved operation.	The same as #400C7 handling
400CB	CS 15 Dark detection during deliver reserved operation.	The same as #400C8 handling
400CC	Detected the remained notes on the sensors in front of cassettes during re-driving.	
400D0	Feeding time out due to jam (CS14) around throat assembly during delivery operation	<ol style="list-style-type: none"> <li>1. Remove a jammed note or foreign objects between the throat and the tray</li> <li>2. Check if the CS 14 sensor cable is disconnected.</li> <li>3. Check the feed motor operation in the throat unit.</li> <li>4. Exchange a sensor after abnormal operating the CS 14 sensor .</li> </ol>
400D1	Feeding time out due to jam (CS14~15) around throat assembly during delivery operation	<ol style="list-style-type: none"> <li>1. Remove a jammed note in the throat.</li> <li>2. Check external light source of the CS 15 sensor.</li> <li>3. Check the feed motor operation in the throat unit .</li> <li>4. If error occurs when checking CS 14 and CS 15 sensor operation, replace a sensor.</li> </ol>
400D2	Feeding time out due to jam (CS10AB) around throat assembly during delivery operation	<ol style="list-style-type: none"> <li>1. Remove a jammed note in the throat.</li> <li>2. Check external light source of the CS10 AB sensor.</li> </ol>

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Error Code	Cause	Handling
		3. Check the feed motor operation in the throat unit . 4. If error occurs when checking CS10 AB sensor operation, replace a sensor.
400D3	The remaining notes on the tray during delivery operation (some notes remaining on CS10AB)	The same as #400D2 handling.
400D4	The remaining notes on the tray during delivery operation (some notes remaining on CS14)	1. Remove a jammed note in the tray 2. Check external light source of the CS14 sensor. 3. If error occurs when checking CS14 sensor operation, replace a sensor
400D5	The remaining notes on the tray during delivery operation (some notes remaining on CS10AB)	The same as #400D2 handling.
400D8	CS41A and CS41B Dark detection during initializing or dispense reserved operation	1. Check 4 Cassette specifications for CDU Version. 2. Remove the remaining notes and foreign objects at the position of the CS41A and CS41B sensors. 3. Check if 3 Cassette FM B/D CN2 and 4 Cassette FM B/D CN1 are connected. 4. Check settings of 4 Cassette FM Board Dip Switch (#3, #5, #6 On) 5. Check if the CS41A and CS41B sensor cables are disconnected (4 CST FM B/D CN3). Exchange a sensor after abnormal operating the CS41A and CS41B sensor
400D9	Simultaneous Dark detection in both the tray (CS10) and throat (CS14/CS15).	1. Remove the remaining notes and foreign objects in the tray and throat unit. 2. Check each sensor (refer to the above description)
400DB	Detected the CS41A Dark during initializing or dispense reserved operation	1. Check 4 Cassette specifications for CDU Version. 2. Remove the remaining notes and foreign objects at the position of the CS41A sensor. 3. Check if 3 Cassette FM B/D CN2 and 4 Cassette FM B/D CN1 are connected. 4. Check settings of 4 Cassette FM Board Dip Switch (#3, #5, #6 On) 5. Check if the CS41A sensor cable is disconnected (4 CST FM B/D CN3). 6. Exchange a sensor after abnormal operating the CS41A sensor.
400DC	CS41B Dark detection during initializing or dispense reserved operation	1. Check 4 Cassette specifications for CDU Version. 2. Remove the remaining notes and foreign objects at the position of the CS41B sensor. 3. Check if 3 Cassette FM B/D CN2 and 4 Cassette FM B/D CN1 are connected. 4. Check settings of 4 Cassette FM Board Dip Switch (#3, #5, #6 On) 5. Check if the CS41B sensor cable is disconnected (4 CST FM B/D CN3). 6. Exchange a sensor after abnormal operating the CS41B sensor.

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Error Code	Cause	Handling
		CS41B sensor.
400DD	4 Cassette not available during dispense reserved operation	<ol style="list-style-type: none"> <li>1. Mount 4 cassette</li> <li>2. Check if 3 Cassette FM B/D CN2 and 4 Cassette FM B/D CN1 are connected.</li> <li>3. Check settings of 4 Cassette FM Board Dip Switch (#3, #5, #6 On)</li> <li>4. Check if the CS37 sensor cables are disconnected (4 CST FM B/D CN3).</li> <li>5. Exchange a sensor after abnormal operating the CS47 sensor .</li> </ol>
400DE	Mounting/demounting 4 Cassette during dispense operation	<ol style="list-style-type: none"> <li>1. Check notes' status in 4 Cassette</li> <li>2. Check 4 cassette specifications</li> <li>3. Check if 3 Cassette FM B/D CN2 and 4 Cassette FM B/D CN1 are connected.</li> <li>4. Check settings of 4 Cassette FM Board Dip Switch (#3, #5, #6 On)</li> <li>5. If error occurs when checking the CS47's (4 CST FM B/D CN3) disconnection and operation, replace a sensor.</li> </ol>
400DF	4 Cassette miss feed during dispense operation	<ol style="list-style-type: none"> <li>1. Check the remaining notes in 4 Cassette</li> <li>2. Check if the 4 Cassette remaining note sensor (CS46) is normal.</li> <li>3. Check a jammed note in 4 Cassette or remount it</li> <li>4. Remove the dust on the CS41A and CS41B sensors.</li> <li>5. Replace 4 cassette box when multiple error occur.</li> </ol>
400E0	Dark light sensor test error (CS11A, CS11B, CS4) during initializing.	<ol style="list-style-type: none"> <li>1. Check if each sensor is mounted.</li> <li>2. If error occurs when checking CS11A cable operation, replace a sensor.</li> <li>3. If error occurs when checking CS11B cable operation, replace a sensor.</li> <li>4. If error occurs when checking CS4 cable operation, replace a sensor.</li> </ol>
400E1	Dark light sensor test error (CS13) during initializing.	<ol style="list-style-type: none"> <li>1. Check if a sensor is mounted.</li> <li>2. If error occurs when checking CS13(CDU B/D CN10 #1~4) cable operation, replace a sensor.</li> </ol>
400E2	Dark light sensor test error (CS21A, CS21B) during initializing.	<ol style="list-style-type: none"> <li>1. Check if each sensor is mounted.</li> <li>2. If error occurs when checking CS21A (cable operation, replace a sensor.</li> <li>3. If error occurs when checking CS21B(cable operation, replace a sensor.</li> </ol>
400E3	Dark light sensor test error (CS31A, CS31B) during initializing.	<ol style="list-style-type: none"> <li>1. Check if each sensor is mounted.</li> <li>2. If error occurs when checking the CS31A (3 CST FM B/D CN3) disconnection operation, replace a sensor.</li> <li>3. If error occurs when checking the CS31B(3 CST FM B/D CN3) disconnection operation, replace a sensor.</li> <li>4. Check if the CDU Board CN6 and 3 Cassette FM</li> </ol>

**MoniMax 5600****12. Error Code and Troubleshooting**

Error Code	Cause	Handling
		Board CN1 are connected. 5. Check settings of 3 Cassette FM Board Dip Switch (#2, #4, #6 On)
400E6	Dark light sensor test error (CS41A, CS41B) during initializing.	1. Check the CDU information setting (4 Cassettes). 2. Check if each sensor is mounted. 3. If error occurs when checking the CS31B(4 CST FM B/D CN3) disconnection operation, replace a sensor. 4. Check if 3 Cassette FM B/D CN2 and 4 Cassette FM B/D CN1 are connected. 5. Check settings of 4 Cassette FM Board Dip Switch (#3, #5, #6 On) 6. If error occurs when checking the CS31A (4 CST FM B/D CN3) disconnection operation, replace a sensor.
400E7	Dark light sensor test error (CS10A, CS10B, CS9) during initializing.	1. Check if each sensor is mounted. 2. If error occurs when checking CS 10 A/B disconnection operation, replace a sensor. 3. If error occurs when checking CS 9 disconnection operation, replace a sensor.
400E8	Dark light sensor test error (CS14, CS10) during initializing.	1. Check if each sensor is mounted. 2. If error occurs when checking CS14 cable operation, replace a sensor. 3. If error occurs when checking CS10 cable operation, replace a sensor.
400EA	Dark light sensor test error (CS18,28,38,48).during initializing.	
400EF	Bill is retracted during INITIALIZE COMMAND	
400F0	Disabled to drive due to throat jam during forced initialization.	1. Remove the remaining notes and foreign objects in the throat unit.
400F3	Time out due to Jam (CS15) during initializing or retract process.	
400F4	Disable to drive due to continuous CS14~CS10AB Dark during forced initialization or retract operation (jam)	The same as #400F3 handling
400F5	Disable to drive due to continuous CS10 Dark during forced initialization or retract operation (jam)	The same as #400F3 handling
400F6	Failed to fall down bills during forced initializing and retract operation	1. Remove the remaining notes and foreign objects in the throat unit. 2. If error occurs when checking disconnection operation, replace a sensor.
400F7	Continuously detected note in CS15 during retract operation	The same as #400F3 handling
400F8	Time out due to Jam (CS14) during initializing or retract process.	1. Remove the remaining notes and foreign objects in the throat unit.

**MoniMax 5600****12. Error Code and Troubleshooting**

Error Code	Cause	Handling
400F9	Some bills are taken out during delivery operation	
400FA	Invalid ID of 1st cassette is requested to dispense	
400FB	Invalid ID of 2nd cassette is requested to dispense	
400FC	Invalid ID of 3rd cassette is requested to dispense	
400FD	Invalid ID of 4th cassette is requested to dispense	
400FE	Reject transaction happens again during bundle reject mode.	
400FF	Enforcedly remove cash during reserve/retract operation (subnormal exit)	
97120	Unable to create INI file	
97121	Unable to read file	
97122	Unable to write file	
97123	Unable to close file	
97124	Unable to delete file	
97125	Unable to copy file	
97126	Unable to create directory	
97190	In case other command is executed in Cash Unit Exchange	
97191	In case it is not eh Cash Unit Exchange	
97192	Cash dispenser service is already cash in state	
97193	In case it is not the status of Cash In	
97194	In case the ID of cassette don't match	
97195	In case the cassette counting don't match	
97196	In case the number of cassette don't match	
97197	In case the dispensed bills are different from the requested ones.	

**MoniMax 5600****12. Error Code and Troubleshooting**

Error Code	Cause	Handling
97198	In case two ID are same in cassette	
971A0	In case the dispensed denominations are different from the requested ones.	
971A1	In case the dispensed currency is different from the requested one.	
971A2	Unable to dispense bills	
971A3	In case requested bill counts are exceeded the maximum count	
971A4	In case requested coin counts are exceeded the maximum count	
971A5	Unable to define Mix method	
971B0	There isn't any bills on stacker	
971C0	In case that unsupported command is executed	
971DX	In case partial bills only are dispensed from the requested bills. (X is the number of cassette)	
97447	Cassette 1 misfeed	
9745B	Cassette 2 misfeed	
9749F	Cassette 3 misfeed	
9747C	Cassette 4 misfeed	
9740010	Fail to open port	
97414	Dark light sensor error (CS4) during idle status of cash dispenser	
97428	Dark light sensor error (CS13) during idle status of cash dispenser	
974BA	Dark light sensor error (CS1) during idle status of cash dispenser	
97423	Dark light sensor error (CS11A, CS11B) during idle status of cash dispenser	
9743F	Dark light sensor error (CS21A, CS21B) during idle status of cash dispenser	
9749B	Dark light sensor error (CS31A, CS31B) during idle status of cash dispenser	

**MoniMax 5600****12. Error Code and Troubleshooting**

Error Code	Cause	Handling
974D8	Dark light sensor error (CS41A, CS41B) during idle status of cash dispenser	
9740020	Fail to produce file	
9740025	Fail to copy file	
9740101	In case of being selected cassette not dispensed	
4DN00	Abnormal communication	
4DN01	Abnormal response from EP	

**MoniMax 5600****12. Error Code and Troubleshooting****5) Etc**

Error Code	Cause	Handling
9701010	Failed to connect communication between SP of PIN and EP of one	1.Check if communication cable or com port is not connected
9701012	Failed to deliver to data of EPP's SP	1.Check if communication cable or com port is not connected
9701016	Received data time out of EPP	1.Check if communication cable or com port is not connected
9701017	Delivered data time out of EPP	1.Check if communication cable or com port is not connected
9701031	Failed to read Register of EPP	
9701040	Failed to produce Thread of EPP	
9701111	BCC error of EPP	Check BCC logic of EPP
970401D	Failed to connect to SPL	Check if PncComm.dll and ComMonitor.exe files are available
9707012	Failed to receive data of VFD	
9707082	Failed to deliver the message about Fire Event	